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The publications of the National Museum consist of two series: Proceedings and Bulletins.

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The Bulletin, publication of which was begun in 1875, is a series of elaborate papers, issued separately and based for the most part upon collections in the National Museum. They are monographic in scope, and are devoted principally to the discussion of large zoological groups, bibliographies of eminent naturalists, reports of expeditions, etc.

A quarto form of the Bulletin, known as the "Special Bulletin," has been adopted in a few instances in which a larger page was deemed indispensable.

The Annual Report of the National Museum (being the second volume of the Smithsonian Report) contains papers chiefly of an ethnological character, describing collections in the National Museum.

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S. P. Langley,
Secretary of the Smithsonian Institution.

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ERRATA.

Page 761. The generic name *Chasmias*, proposed in these Proceedings for a genus of gobioid fishes, is preoccupied by *Chasmias* Ashmead, a genus of Ichneumon insects, proposed somewhat earlier in the same Proceedings. For the genus of fishes typified by *Chasmias misakius* the name *Chasmichthys* Jordan and Snyder may be substituted.

Page 908. The generic name *Melanostoma* is twice preoccupied. Dr. Günther (Deep Sea Fishes of the Challenger, XXII, p. 16, 1887) has substituted for it the name *Synagrops*. The Japanese species should therefore stand as *Synagrops japonica*.

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CLASSIFICATION OF THE ICHNEUMON FLIES, OR THE SUPERFAMILY ICHNEUMONOIDEA.

By WILLIAM H. ASHMEAD,

Assistant Curator, Division of Insects.

The characters common to genera give those of the higher groups; the orders and their common characters combine to form those of the classes. It depends, therefore, upon every classifier how far he will proceed in separation and subdivision. Indeed, much difference of opinion exists upon the determination of the groups between the species and the order, whence have arisen the several definitions of subgenus, genus, and tribe. In fact, opinions will never harmonize upon the claims of genera, because no universal principle for the structure of genera in any artificial subdivision can be given. This principle is in itself exceedingly capricious, and if one maintains thus far a genus extends, and another thus far, both are certainly right, if only every group, which they distinguish as genera, is distinguished by similar and exclusive characters. Burmeister.

The pertinency of this quotation from one of the great masters of the science of entomology will be better understood and appreciated when the body of this work is examined and it is found that no less than *eleven hundred and forty genera*, or more, have been recognized and tabulated, although when Burmeister penned the above lines, in 1835, the Ichneumonoidea contained only about *one hundred and nine genera.* If we go back to the early days of Burmeister, we find, too, that authorities differed as to the value and utility of some of these genera, just as they differ to-day. In my tables, therefore, there will be found many genera which by some eminent living hymenopterologists are thought to be of no value, but which the writer, on the contrary, holds to be good and distinct—a difference of opinion that time alone can settle.

Very few persons have given any attention to these insects, and the necessity for these fine subgeneric and tribal divisions is evidently apparent to only a few active workers. The great majority of the workers in other groups seem totally ignorant of this vast complex, or at least have no conception of its immensity or the difficulties encountered in studying and identifying material belonging to it derived from different parts of the world.

The writer has now been studying the Hymenoptera for twenty-five years, and much of this time has been devoted specially to studies in

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the *Parasitica*—the Proctotrypoidea, Cynipoidea, Chalcidoidea, and for the past ten years or more, to studies in the Ichneumonoidea. H has had material for examination from all parts of the world, and hopes in the tables he is now publishing, to place the families, subfamilies tribes, and genera on a better foundation, thus enabling students t avoid many of the difficulties he himself encountered, to create a interest in their collecting, and to stimulate their systematic study.

The first systematist to fully appreciate the immensity of this complex, to bring order out of confusion, and to lay a safe foundation for its study and classification, was Dr. Arnold Förster, of Aachen Germany, who accomplished this great work in two contributions entitled Synopsis der Familien und Gattungen der Braconen, published in 1862, and Synopsis der Familien und Gattungen der Ichneumonen, published in 1868.

My own work in this superfamily is based almost entirely upo that of Förster's, and it is scarcely necessary for me to state that without his contributions for my guide the present work would hav been almost impossible.

The more I study Förster's works on the parasitic Hymenoptera the greater is my admiration for him and his work, and it was wit the utmost astonishment I found that these important contributio had remained so long neglected, unappreciated, and, until within comparatively recent years, almost totally ignored by American an European students.

Dr. Förster went too far in calling his groups families, but in th majority of cases these so-called families represented natural groups and as such ought to have been sooner recognized. His groups in th family *Braconidæ* have been recognized in most cases as subfamilie by the Rev. T. A. Marshall, in his monographs of the European specie while in the present work I have recognized his so-called families i the *Ichneumonidæ* as either equivalent to subfamilies or tribes.

In order that the position of this immense complex in the orde Hymenoptera may be thoroughly understood, I reproduce here a corrected table of the superfamilies:

TABLE OF SUPERFAMILIES.[1]

Suborder I. Heterophaga. Abdomen petiolate or subpetiolate, never broadly sessil
larvæ apodous.
* Hypopygium entire, and closely united with the pygidium, the sting or ovipo
itor when present always issuing from the tip of t
abdomen.

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[1] The numbering of the superfamilies and families in this paper conform to scheme of arrangement of the whole order Hymenoptera, as proposed by the writ in John B. Smith's Insects of New Jersey, Trenton, 1900, pp. 500–613. Tables f the recognition of the 94 families into which the order is now divided will be giv at the end of this work.

a. **Pronotum** not extending back to the tegulæ; trochanter *one-jointed.*

b. Hind tarsi dilated or thickened; pubescence of head and thorax feathery or plumose. Superfamily I. APOIDEA.

bb. Hind tarsi slender, not dilated or thickened; pubescence of head and thorax simple, not plumose.

Superfamily II. SPHECOIDEA.

aa. **Pronotum** extending back to the tegulæ, or the latter absent.

c. Trochanters always *one jointed.*

d. Abdomen variable, rarely twice longer than the head and thorax united, most frequently much shorter; hind tibiæ in female neither inflated nor strongly constricted at base.

Petiole or first segment of abdomen simple, *without* a scale or node; winged forms *with* well developed tegulæ.

Superfamily III. VESPOIDEA.

Petiole or first segment of abdomen with one or two scales or nodes; winged forms *without* or with very imperfectly formed tegulæ. Superfamily IV. FORMICOIDEA.

dd. Abdomen in female greatly elongated, several times longer than the head and thorax united, the segments constricted at sutures and flexible; hind tibiæ in female inflated and strongly constricted at base; abdomen in male not especially long, clavate. (Pelecinidæ.)

Superfamily V. PROCTOTRYPOIDEA (part).

cc. Trochanters *two-jointed.*

Mandibles large, 4-dentate; hind wings *with* a distinct venation, with two basal cells and a radius. (Trigonalidæ.)

Superfamily III. VESPOIDEA (part).

Mandibles never very large nor 4-dentate, either simple or bidentate, or at the most 3-dentate; hind wings *without* a distinct venation, or at most and *rarely* with only one basal cell, the radius always absent.

Superfamily V. PROCTOTRYPOIDEA.

* * **Hypopygium** divided or never united closely with the pygidium, the ovipositor issuing some distance *before* the tip of the abdomen; trochanters always *two-jointed.*

d. Front wings always *without* a stigma, the marginal vein, if present, linear never large or stigmated; abdomen with the ventral segment hard and chitinous, without a fold.

e. Pronotum extending back to the tegulæ; front wings with a marginal and basal cell, either complete or incomplete; antennæ straight, not elbowed.

Superfamily VI. CYNIPOIDEA.

ee. Pronotum *not* extending back to the tegulæ; front wings with neither a marginal cell nor a distinct basal cell, the latter, if at all indicated, usually poorly defined by hyaline veins visible only by transmitted light; hind wings without a basal cell; antennæ elbowed.

Superfamily VII. CHALCIDOIDEA.

dd. Front wings *with* a stigma, the marginal vein usually large or stigmated (rarely linear in some Alysiidæ); abdomen with the ventral segments most frequently soft and membranous, with a fold (rarely hard and chitinous without a fold, *Evaniidæ* and *Agriotypidæ*); pronotum always extending back to the tegulæ; antennæ straight, not elbowed.

Superfamily VIII. ICHNEUMONOIDEA.

Suborder II. **Phytophaga.** Abdomen broadly sessile; larvæ *with* legs; trochant two-jointed.

Anterior tibiæ with only *one* apical spur........Superfamily IX. SIRICOIDE

Anterior tibiæ with *two* apical spurs....Superfamily X. TENTHREDINOIDE

CLASSIFICATION.

Superfamily VIII. ICHNEUMONOIDEA.

This group has in the past received the following names:

1744. *Ichneumon* Linnæus (part), Syst. Natur., 4th ed.
1807. *Pupophaga* Latreille (part), Gen. Crust. et Ins., III, p. 249.
1809. *Ichneumonides*, Family IV, Latreille, Fam. Natur. du Règne anim., p.
1823. *Entomotilla*, Dumeril (part), Considér. génér. sur l. classe d. Ins., p. 22
1837. *Parasitica*, Hartig (part), Wiegmann's Archiv., I, p. 158.
1840. *Entomophaga*, Div. I, Spiculifera, Westwood (part), Intro. Mod. Cla Ins., II, p. 83.
1899. *Ichneumonoidea*, Superfamily VIII, Ashmead, Jour. N. Y. Ent. Soc., V p. 47.

No one, I think, who will make use of the above table of superfa lies, can fail to place correctly any parasitic wasp belonging to t superfamily.

It is unquestionably the largest and most extensive complex in t order Hymenoptera, with possibly the exception of the Chalcidoide and is composed of a vast number of minor groups, representing hu dreds of genera and many thousand species.

Not less than a million species will be found existing on the glob although the known or described species do not yet reach much ov 10,000.

Unlike some species, in others of these great complexes, all, wi out a single exception, are genuine parasites, and destroy or devo the eggs, larvæ, pupæ, or imagoes of other insects; scarcely a sing order of insects is free from their attacks, and even relatives in th own order and family are devoured by them.

The group, therefore, taken as a whole, is of the greatest econon importance, since the vast majority of the species composing it a beneficial to man. No other group of insects has a more importa rôle in the economy of nature.

It is composed of innumerable species of the greatest variety shape and size, from the most minute or microscopic size, measuri scarcely a millimeter in length, to forms that attain an inch, an in and a half, or even two inches or more in length, and with or withou prominently exserted ovipositor, the ovipositor sometimes attaini a length of four or five inches, and the group is in consequence one the most difficult and perplexing to classify.

The fauna of no single country is yet thoroughly known and private and public collections are crowded with undescribed forms.

Up to the present time no general work on the group has been published, and this contribution is the first effort made to classify the group as a whole or to bring together in systematic order, or in tabular form, the families, subfamilies, tribes, and the described genera of the world.

The author, although familiar with all of the groups and with most of the genera, has in some cases been compelled to rely upon descriptions for placing certain of the genera. The work, therefore, must be imperfect in some particulars, but he hopes for it a kindly reception, and trusts it will not only stimulate the collecting of these important insects, but that it will afford an aid and a guide for future study.

The families recognized may be distinguished by the use of the following table:

TABLE OF FAMILIES.

Wingless forms 7
Winged forms 2
2. Costal and subcostal veins confluent, extending close together, side by side, the costal cell therefore absent 3
  Costal and subcostal veins separated, a space between, the costal cell therefore present, distinct.
    Abdomen inserted normally, sessile or subsessile, or the first segment long, petioliform; front wings with only one recurrent nervure; head most frequently globose and usually tuberculous.................. 6
    Abdomen petiolated, inserted upon the dorsum of the metathorax, the body of same usually strongly compressed; front wings with one or two recurrent nervures, more rarely with none; head variable but never globose nor tuberculous; antennæ 13–14 jointed, inserted either just above the clypeus or far above it on the middle of the face. Family LXXIV. EVANIIDÆ.
3. Front wings with *two* recurrent nervures (the second recurrent absent only in the genus *Pharsalia* Cresson) 4
  Front wings with only *one* recurrent nervure or with none 5
4. First cubital and first discoidal cells always confluent; abdominal segments 2–3 usually flexible, rarely connate; mandibles attached normally.
    Ventral abdominal segments hard and chitinous, without a fold; dorsal segments 2 and 3 connate, *not* flexible; scutellum spined. Family LXXV. AGRIOTYPIDÆ.
    Ventral abdominal segments soft and membranous, usually with a fold; dorsal segments 2 and 3 flexible; scutellum rarely spined. Family LXXVI. ICHNEUMONIDÆ.
  First cubital and first discoidal cells separated, distinct, not confluent; mandibles attached abnormally, the tips turned outwardly and not meeting when closed...................... Family LXXVII. ALYSIIDÆ.
5. Mandibles attached abnormally, the tips turned outwardly, not meeting when closed ....Family LXXVII. ALYSIIDÆ.
  Mandibles attached normally.
    Abdominal segments 2 and 3 most frequently rigid, connate, not flexible; if not rigid, then all the segments are flexible; abdomen never greatly elongate and strongly compressed; first cubital and first discoidal cells, although not always, most frequently distinct and separated. Family LXXVIII. BRACONIDÆ.

Abdominal segments 2 and 3 flexible, the abdomen very elongate, narrow, and strongly compressed; first cubital and first discoidal cells always confluent. (*Pharsalia* Cresson.)
Family LXXVI. ICHNEUMONIDÆ.

6. Antennæ inserted close to the clypeus; hind femora most frequently swollen, and usually, but not always, toothed beneath.
Family LXXIX. STEPHANIDÆ.

7. Mandibles attached abnormally, the tips turned outwardly and not meeting when closed .... ALYSIIDÆ.
Mandibles attached normally, the mandibles when closed meeting or crossing each other.
Abdominal segments 2 and 3 flexible .... ICHNEUMONIDÆ.
Abdominal segments 2 and 3 rigid, connate, not flexible .... BRACONIDÆ.
All abdominal segments flexible (*Aphidinæ*) .... BRACONIDÆ (part).

Family LXXIV. EVANIIDÆ.

1802. *Evaniales* LATREILLE, Hist. Nat. Crus. et Ins., III, p. 328.
1815. *Evanides* LEACH (part), Edinb. Encyc., IX, p. 142.
1838. *Evaniadæ*, Family I, HALIDAY, Ent. Mag., V, p. 212.
1839. *Evaniadæ*, Family 8, HALIDAY, Hym. Synop., p. ii.
1839. SHUCKARD, Newman's Entomologist, I, p. 120.
1840. *Evaniidæ*, Family 2, WESTWOOD, Intro. Mod. Class Ins., II, p. 124.
1883. *Evaniales* THOMSON, Opus. Ent., IX, p. 844.
1887. *Evaniidæ* CRESSON, Syn. Hym. North America, p. 36.
1889. SCHLETTERER, Ann. k. k. Naturh. Hofmus., IV, p. 115.
1900. *Evaniidæ*, Family LXXIV, ASHMEAD, Smith's Insects of New Jersey, p. 563.

This family is readily distinguished from all the others by the attachment of the abdomen. The abdomen is, as a rule, strongly compressed, petiolate, and attached to the dorsum of the metathorax, either just back of the scutellum or posteriorly upon or near the superior margin of the truncature, but never normally at apex, between the hind coxæ, as in all other ichneumonids, with but two or three exceptions. It is further distinguished from all the other families, except the *Stephanidæ*, by having a *distinct costal cell* in the front wings, the costal and subcostal veins, unlike other ichneumonids, being distinctly separated.

The family is usually divided into two subfamilies, but I have here recognized three major groups, separable upon good structural characters, and further supported by their economy or different habits of the species composing them.

These three subfamilies may be easily recognized by the aid of the following table:

TABLE OF SUBFAMILIES.

Antennæ inserted far anteriorly just above the clypeus 2
Antennæ inserted far *above* the clypeus *on*, or very near the middle of the face.
Front wings *without* or at most with only one recurrent nervure; venation in hind wings wanting or indistinct, *without* a median cell.
Pronotum very short, transverse linear and abruptly truncate anteriorly; abdomen attached by a petiole to the superior margin of the metatho-

racic truncature, remote from the scutellum, the body short and compressed, the ovipositor not or at most subexserted; head viewed from above transverse, the temples never very broad.
Subfamily I. EVANIINÆ.

Pronotum elongate, conical, never transverse linear, abdomen attached to the base of the metanotum just behind the scutellum, the body very long, usually long, sickle-shaped, compressed; the ovipositor long or always strongly exserted; head viewed from above subtriangular or obtrapezoidal, the temples oblique but very broad or broad, more rarely globose .... Subfamily II. GASTERUPTIONINÆ.

2. Front wings most frequently with two recurrent nervures, the second sometimes subobsolete, rarely wholly absent; hind wings with a distinct median cell; abdomen clavate, not strongly compressed, the ovipositor exserted.
Subfamily III. AULACINÆ.

Subfamily I. EVANIINÆ.

1900. *Evaniinæ*, Subfamily II, ASHMEAD, Smith's Insects of New Jersey, p. 563.

The position of the antennæ, the venation of the front and hind wings, as well as the shape of the abdomen, readily distinguish this group from the *Aulacinæ*, while from the *Gasteruptioninæ* it is at once separated by the shape of the head, the very short truncate pronotum, and the short, strongly compressed, hatchet-shaped abdomen and its attachment to the metathorax.

All the species falling in the subfamily are parasitic in the eggs of cockroaches. *Evania appendigaster* Linnæus, a species now widely distributed to all parts of the world, has been frequently bred from the eggs of these insects. In Florida I have reared it from the eggs of *Periplaneta americana* Linnæus and *P. australasiæ* Fabricius. I have also a specimen of *Hyptia dorsalis* Westwood, bred by Mr. Weed, in Mississippi, from the eggs of *Ischnoptera pennsylvanica* De Geer.

Only two genera are known, distinguished as follows:

TABLE OF GENERA.

Front wings *without* a marginal cell and also *without* cubital and discoidal cells.
(1) *Hyptia* Illiger.

Front wings *with* a marginal cell and also with one or two discoidal cells.
(2) *Evania* Fabricius.

Subfamily II. GASTERUPTIONINÆ.

This group, or subfamily, is at once separated from the *Aulacinæ* by the insertion of the antennæ, the venation of front wings, and by the attachment of the abdomen, which is joined to the metathorax just behind the scutellum.

It approaches nearest to the *Evaniinæ*, but is easily separated by the quite different shaped head, which is long, obtrapezoidal, as viewed from above; by the very long conical pronotum; by the abdomen, which is very long, narrow, and strongly compressed, and attached differently; and by the shape of the hind legs, which differ decidedly from the other two subfamilies, the femora being shorter and thicker, the tibiæ very strongly clavate, while the basal joint of the tarsi is stout, and as long or a little longer than the following joints united:

The habits of the species, too, are quite different from the others, since all whose parasitism is known have been bred from the nests of wasps and bees—*Crabro*, *Philanthus*, *Cerceris*, *Gorytes*, *Stizus*, *Eumenes*, *Odynerus*, *Sphecodes*, *Prosopis*, *Halictus*, *Andrena*, etc.

The two genera falling in this group may be separated as follows:

TABLE OF GENERA.

Front wings *without* a distinct venation, at most with only slight traces of a venation, as in *Pelecinus;* head globose and deeply excavated anteriorly above for the reception of the scape .... (3) *Leptofoenus* Smith.

Front wings *with* a distinct venation; head large, viewed from above subtriangular or obtrapezoidal, the temples oblique, broad; no excavation anteriorly for the reception of the scape .... (4) *Gasteruption* Latreille = *Foenus* Fabricius.

Subfamily III. AULACINÆ.

1840–42. *Aulacidæ*, Family, SHUCKARD (part), Newman's Entomologist, p. 121.
1900. *Aulacinæ*, Subfamily I, ASHMEAD, Smith's Insects of New Jersey, p. 563.

This group was first recognized by W. E. Shuckard as above, but he incorrectly included as components of it *Trigonalys* Westwood and *Lycogaster* Shuckard, which have no real affinity with it, but represent a distinct family far removed from any family belonging in this series.

The *Trigonalidæ* are now placed in the superfamily *Vespoidea* between the *Bethylidæ* and the *Sapygidæ*.

The *Aulacinæ*, as here restricted, are easily distinguished from the other two subfamilies by having the antennæ inserted on the anterior margin of the head, just above the clypeus, by the quadrate or subglobose head, and by the venation of the front wings, which have usually two recurrent nervures.

The abdomen, too, is quite different from the other groups, being elongate, clavate, and only slightly compressed.

All of the species are parasitic on the larvæ of different Coleoptera, those belonging to the family *Cerambycidæ* being particularly subject to their attacks.

Three genera have been recognized, distinguishable as follows:

TABLE OF GENERA.

First cubital cell receiving the first recurrent nervure toward the middle; hind coxæ swollen, much elongate, and prolonged within beyond the insertion of the trochanters .... (5) *Pammegischia* Provancher.

First cubital cell receiving the first recurrent nervure at or near the tip, or interstitial with the first transverse cubitus; hind coxæ normal, not prolonged within.

Claws with *one* tooth beneath .... (6) *Aulacus* Jurine.

Claws with *three* or more teeth beneath................(7) *Pristaulacus* Kieffer.

Family LXXV. AGRIOTYPIDÆ.

1832. *Agriotypus* Walker, Curtis Brit. Ent., IX, pl. 389.
1838. *Agriotypidæ*, Family III, Haliday, Ent. Mag., V, p. 212.
1868. *Agriotypoidæ* Förster, Verh. d. naturh. Ver. pr. Rheinl., XXV, p. 143.
1884. *Agriotypidæ* Bridgman and Fitch, The Entom., XVII, p. 121.

This is probably one of the most interesting families in the superfamily *Ichneumonoidea*, not only on account of its rarity, its structural peculiarities, and its aquatic habits, but also on account of being represented, up to the present time, by but a single genus with a single species—the *Agriotypus armatus* Walker.

A doubt as to its proper position in this great complex has been expressed by several eminent entomologists, and quite recently Dr. David Sharp has suggested its close relationship with the *Proctotrypidæ.* I myself have long had doubts as to its true position, but now, after a careful study of specimens of both sexes, am prepared to defend its position here, the only character at variance with any in this major group being in the abdomen, which has the venter hard and chitinous, as in the higher Hymenoptera, the *aculeata* or *monotrocha.* All its other characters are, however, as with the genuine Ichneumonids and with the Braconids.

The trochanters are two jointed; the wings and their venation as in most Ichneumonids, the costal cell being absent, the subcostal vein lying close to and extending parallel with the costal vein; there are two recurrent nervures, the second received beyond the first transverse cubitus, the first cubital and first discoidal cells confluent, the first abscissa of the cubitus being absent; there are two basal cells, two complete discoidal cells, and a short triangular marginal cell, while the stigma is broad and oblong; the hind wings have a distinct venation, the submedian cell being about half the length of the median, the subdiscoidal nervure being distinct and originating from the transverse median nervure a little below the middle.

The venter, although hard and chitinous as in the genuine wasps and Proctotrypids, has the ovipositor subexserted, issuing from before its tip, and structurally is the same as in the Ichneumonids and the Braconids. In the male the external claspers are unusually long and broad, a character sometimes met with in males belonging to the *Tryphoninæ* and the *Ophioninæ.* The spined scutellum in *Agriotypus* is quite unique, although a somewhat similar spined scutellum is found in some Ophionines.

The only species, *Agriotypus armatus* Walker, is unknown outside of the European fauna. It attacks the larvæ of various species of *Trichoptera* belonging to the genera *Silo*, *Goera*, *Trichostoma*, *Aspatherium*, and *Odontocerum* and has been observed swimming and diving under water to seek its prey.

Generic-characters same as family ....(1) *Agriotypus* Walker = *Cratopus* Holmgren.
(Type, *Agriotypus armatus* Walker.)

Family LXXVI. ICHNEUMONIDÆ.

1815. *Ichneumonida* LEACH (part), Edinb. Encycl., IX, p. 142.
1837. *Parasitica* HARTIG (part), Wiegmann's Archiv., I, p. 158.
1838. *Ichneumonidæ*, Family II, HALIDAY, Entom. Mag., V, p. 4.
1840. *Ichneumonidæ*, Family III, WESTWOOD, Intro. Mod. Class., Ins., II, p. 83.
1900. *Ichneumonidæ*, Family LXXVI, ASHMEAD, Smith's Insects of New Jersey.

This family is readily distinguished from the *Evaniidæ* and the *Stephanidæ* by the absence of a distinct costal cell in the front wings, the costal and subcostal veins being parallel and extending close together, side by side, to the stigma; by the abdomen being attached normally, not high up on the dorsum of the metathorax, and by the venation of the hind wings. From the *Alysiidæ* it is separated by the normally attached mandibles, as well as by palpial characters, while from the *Braconidæ* it is separated by the venation of the front wings, having, except in a single case, two recurrent nervures, whereas the *Braconidæ* have none or only one. The first cubital and the first discoidal cells are also always confluent, not distinctly separated as in the normal wings of a Braconid, and also by the usually longer abdomen and by the flexibility of the first and second segments, which in the *Braconidæ* are rigid, connate, or not at all flexible, except in the subfamily *Aphidiinæ*.

The family *Ichneumonidæ* may be divided first into five major groups, called subfamilies, as follows:

TABLE OF SUBFAMILIES.

First abdominal segment straight, not elbowed, most frequently sessile or subsessile, more rarely petiolate, its spiracles usually placed at or before the middle, more rarely somewhat behind the middle; in the latter case the abdomen is compressed; if petiolate, the petiole is usually abruptly enlarged at apex, the spiracles being closer to each other than to the apical margin (very rarely widely separated) 2

First abdominal segment petiolate, not straight, or very rarely, but depressed, curved, bent, or elbowed, and most frequently widened at the apical third, its spiracles placed always beyond the middle or between the middle and the apex; areolet in front wings usually pentagonal or small quadrate, rarely deltoid, petiolate, or rhomboidal, although often absent.

Mesosternum not separated from the mesopleura by a grooved line or furrow; spiracles of first abdominal segment wider from each other than to the apex of the segment; ovipositor hidden or at most subexserted; areolet of front wings pentagonal, rarely deltoidal or rhomboidal, or incomplete; no apterous forms ....Subfamily I. ICHNEUMONINÆ.

Mesosternum separated from the mesopleura by a grooved line or furrow; spiracles of first abdominal segment nearer to each other than to the apex of the segment; ovipositor exserted, prominent, rarely very short; areolet of front wings pentagonal or small quadrate, often incomplete or wanting; apterous and subapterous forms common.
Subfamily II. CRYPTINÆ.

2. Abdomen usually depressed and sessile, never strongly compressed, although sometimes compressed toward apex, more rarely petiolate; spiracles of

first segment placed at or a little *before* the middle, rarely slightly behind the middle.

Abdomen elongate, subcylindrical, most frequently sessile, rarely petiolate or subcompressed at apex; ovipositor always prominent, often very long; areolet in front wings, when present, usually rhomboidal or triangular, very rarely pentagonal .... Subfamily III. PIMPLINÆ.

Abdomen not or rarely very long, depressed, and sessile, fusiform, clavate, ovate, or oval, more rarely distinctly petiolate; ovipositor hidden, never prominent, at the most subexserted; areolet triangular, rhomboidal or wanting, rarely pentagonal ..... Subfamily IV. TRYPHONINÆ.

Abdomen usually long, wholly compressed or compressed along the posterior half, rarely subcylindrical; in the latter case the petiole is somewhat abruptly dilated at apex; spiracles of first segment most frequently placed at or behind the middle, more rarely before; areolet in front wings usually triangular, rhomboidal or wanting, often petiolate; ovipositor either hidden or prominent .... Subfamily V. OPHIONINÆ.

Subfamily I. ICHNEUMONINÆ.

1900. *Ichneumoninæ*, Subfamily I, ASHMEAD, Smith's Insects New Jersey, p. 563.

To this subfamily belong Förster's families *Trogoidæ* (= Joppinæ Kriechbaumer), *Ichneumonoidæ*, *Listrodromoidæ*, *Alomyoidæ*, and *Phæogenoidæ*, which, however, are here recognized as tribes, since they represent natural minor groups.

The tribes recognized in this subfamily may be separated by the use of the following table:

TABLE OF TRIBES.

Metathoracic spiracles round or circular, more rarely broadly oval; claws simple, never pectinate 3

Metathoracic spiracles linear or long-oval, but very rarely rounded; if rounded the claws are always pectinate.

Mandibles not bidentate, simple, edentate, acute at apex 2

Mandibles bidentate; head not broader than long.

Metanotum with a strong constriction or furrow between it and the postscutellum, the metanotum usually short, with a median elevation toward base and without the basal or first median area, or, if at all present, open; areola often reduced to a tubercle, or if defined usually confluent with the petiolar area, rarely distinct, horse-hoof shaped or broadly transverse; scutellum variable, frequently cone-shaped, pyramidal, or highly convex, rarely very flat; sutures between the abdominal segments often strongly constricted; areolet in front wings tetragonal, triangular, or pentagonal (rarely wanting). Tribe I. JOPPINI.

Metanotum without such a constriction or furrow, at most with only a weak furrow between it and the postscutellum; metanotum rarely short, always *without* a median elevation at base and with the basal or first median area distinct, usually complete, the areola and petiolar are separated, distinct, abdomen normal, not or rarely strongly constricted between the segments; areolet in front wings pentagonal.

Claws simple; second and third abdominal segments *with* lunulæ. Tribe II. ICHNEUMONINI.

Claws pectinate; second and third abdominal segments most frequently *without* lunulæ or at least not present on both segments. Tribe III. LISTRODROMINI.

2. Head, viewed from in front, broader than long; occiput strongly concave, the temples broad, full .... Tribe IV. HERESIARCHINI.
3. Metanotum *without* the basal or first median area, the areola fully two and a half times as long as wide and acutely pointed at base; petiolar area not longer than wide; metathoracic spiracles large, broadly oval. Tribe V. ALOMYINI.
   Metanotum with the basal or first median area distinct, the areola never twice as long as wide and not pointed at base, either truncate or rounded, or, at the most, obtusely triangular at base; petiolar area much longer than wide; metathoracic spiracles rounded or circular, never large .... Tribe VI. PHÆOGENINI.

Tribe I. JOPPINI.

1868. *Trogoidæ*, Family 27, FÖRSTER, Verh. d. naturh. Ver. pr. Rheinl., XXV, pp. 144 and 188.
1894. *Trogini*, Tribe I, ASHMEAD, Proc. Ent. Soc. Wash., III, p. 278.
1898. *Joppinæ*, Subfamily, KRIECHBAUMER, Ent. Nachr., XXIV, p. 2.
1900. *Joppini*, Tribe I, ASHMEAD, Smith's Insects of New Jersey, p. 563.

The typical forms falling in this tribe are easily separated by antennal, scutellar, and abdominal characteristics from those falling in the tribe *Ichneumonini;* but there are several genera which can scarcely be distinguished from genuine ichneumonini, and these must be examined carefully for the metathoracic characters made use of in my table of tribes.

Förster based the group upon the genus *Trogus* Gravenhorst and gave for the family diagnosis a single character—the shape of the scutellum. Kriechbaumer has done no better, although he calls the group a subfamily—the *Joppinæ*, taking the name from the first-described genus, *Joppa* Fabricius. He has, however, given an excellent table, and brought together a number of genera closely related. Kriechbaumer does not include in his table *Joppa* Fabricius, but for the species usually considered as such he has proposed the name *Microjoppa*. He had, of course, the right to segregate the old genus Joppa, but no right to reject it entirely and I have here restored the name *Joppa* for his *Microjoppa*. His genus *Tricyphus*, too, seems to be identical with *Trogus* Gravenhorst.

The following table will aid in separating the genera belonging to this tribe:

TABLE OF GENERA.

Antennæ in female at or beyond the middle widened, compressed; in male beneath serrate; abdomen with more or less distinct angular emarginations, the segments, at least in part, striate or aciculate...... 2
Only one or the other characteristics present 6
2. Wings with at least the tips brown, often also with brown maculæ or bands toward the base or before the middle, seldom wholly or in great part brown 3
   Wings hyaline, the widening of the antennæ often insignificant, scarcely perceptible 4
3. Labrum hidden under the clypeus; head large, with the cheeks more or less swollen; species rather small, mostly yellow, or reddish yel-

low and black; areolet in front wings usually oblique, trapezoidal, not petiolate; scutellum convexly rounded; gastrocœli distinct......(1) *Joppa* Fabricius=*Microjoppa* Kreichbaumer.
(Type, *Joppa dorsata* Fabricius.)

Labrum prominent or projecting; species rather large.

Fifth dorsal abdominal segment in female inclosing the sixth; in male the sixth inclosing the seventh; apex in both sexes sometimes extending into a short point.... (2) *Cryptopyge* Kriechbaumer.
(Type, *Joppa picta* Guérin.)

Fifth dorsal abdominal segment in the female and the seventh in the male distinctly visible; areolet oblique, trapezoidal, petiolate.
(3) *Macrojoppa* Kriechbaumer.
(Type, *Joppa blandita* Cresson.)

4. Antennæ in male lengthened, but scarcely perceptibly widened; areolet pentagonal.. 5

Antennæ in male much thickened at the middle or strongly widened and again narrowed; abdominal segments two and three very flat and with fine close aciculations, the following compressed, almost conically pointed, with fine scattered punctures; areolet small, pentagonal, but so narrowed and contracted as to appear nearly tetragonal ....(4) *Conopyge* Kriechbaumer.
(Type, *Conopyge cinctipes* Kriechbaumer.)

5. Scrobes normal, the lateral margins not produced into tubercles; gastrocœli distinct.

Basal joint of hind tarsi produced below into a flattened leaf-like projection.
(5) *Ileanta* Cameron.
(Type, *Ileanta latitarsis* Cameron.)

Basil joint of hind tarsi normal.

Labrum prominent, projecting; aciculations of abdomen in male very strong, extending to the middle of the fourth segment, in female on to the fifth...............(6) *Lindigia* Kriechbaumer.
(Type, *Lindigia varia* Kriechbaumer.)

Labrum hidden under the clypeus.

Abdomen with the aciculations extending only to the middle of the third segment..............(7) *Pœcilojoppa* Kriechbaumer.
(Type, *Pœcilojoppa histrio* Kriechbaumer.)

Abdomen with all the segments aciculated; scutellum margined at sides; submedian cell a little shorter than the median.
(8) *Ortezia* Cresson.
(Type, *Joppa egregia* Cresson.)

Abdomen with segments two and three ruguloso—punctate, the following almost smooth, shining; gastrocoeli large, oblique, deep, with a narrow space between; scutellum convex; abruptly declivous posteriorly, the sides margined; metathorax with the upper hind angles briefly dentate, the areolet present.
(9) *Henicophatnus* Kriechbaumer.
(Type, *Henicophatnus rufithorax* Kriechbaumer.)

Scrobes with the lateral margins produced into slightly curved tubercles; gastrocœli wanting; scutellum flat; abdomen strongly punctate.
(10) *Abzaria* Cameron.
(Type, *Abzaria latipetiolaris* Cameron.)

6. Antennæ in female dilated between the middle and the apex, more rarely scarcely perceptibly dilated; abdominal segments truncate, without distinct aciculations or foveate impressions, usually punctate; male often difficult to separate from those in the *Ichneumonini;* areo-

let trapezoidal, rarely quadrate, triangular, or pentagonal (rarely wanting) 8

Antennæ in both sexes filiform, not perceptibly dilated at the middle.

Abdomen with more than three visible dorsal segments, and aciculate or striate 7

Abdomen with only three visible dorsal segments, closely and strongly punctate, the third at apex ending in a strong tooth on each side; scutellum at apex tridentate ....(11) *Rothneyia* Cameron.
(Type, *Rothneyia wroughtonii* Cameron.)

7. Legs long and slender, the hind femora extending to or beyond the tip of the abdomen; last ventral segment entire; shape of body and color of wings similar to *Macrojoppa* species.
(12) *Ischnopus* Kreichbaumer.
(Type, *Ischnopus longiceps* Kreichbaumer.)

Legs shorter, at the most the hind femora extending only to the apex of the fourth dorsal segment.

Scutellum flat; wings wholly violaceous black or the anterior are marked with yellow ....(13) *Pedinopelte* Kreichbaumer.
(Type, *Joppa Gravenhorstii* Guérin.)

Scutellum subquadrate, truncate at apex, subconvex above and margined laterally; metathorax short, imperfectly areolated, the spiracles elongate linear; areolet in front wings triangular.
(14) *Obba* Tosquinet.
(Type, *Obba cœlatus* Tosquinet.)

Scutellum more or less pyramidal or conical, immargined; areolet in front wings subpentagonal or subrhomboidal.
(15) *Dinotomus* Förster = *Psilomastix* Tischbein.
(Type, *Ichneumon lapidator* Fabricius.)

8. Scutellum elevated, convex, conical or saddle-shaped; posterior face of metathorax with three parallel areas, rarely entirely wanting or indistinctly defined 9

9. Metathorax normal, the upper hind angles not produced into teeth or spines..10

Metathorax with the upper hind angles produced into teeth or spines, or with a very sharp ledge 14

10. Areolet small or only moderately large, trapezoidal, triangular, or pentagonal..11

Areolet large, in outline quadrate; abdomen with normal number of segments.
(16) *Tetragonochara* Kriechbaumer.
(Type, *Joppa polychroa* Brulle.)

Areolet wanting; abdomen with only three visible dorsal segments.
(17) *Chreusa* Cameron.
(Type, *Chreusa fulvipes* Cameron.)

11. Abdomen *with* a ventral slit at apex 12

Abdomen *without* a ventral slit at apex.

Scutellum and metanotum at base elevated, the postscutellum between also sometimes with a small elevation, the metanotum very short, obliquely truncate from near base; areolet in front wings trapezoidal or rhomboidal, more rarely pentagonal.

Labrum hidden, areola of metanotum obsolete or very minute, sometimes represented by a tubercle; areolet in front wings not pentagonal; scutellum subconical, not margined laterally.
(18) *Trogus* Gravenhorst = *Tricyphus* Kriechbaumer.

Labrum not entirely hidden, rounded anteriorly; areola of metanotum distinct, usually horse-hoof shaped; areolet in front wings usually pentagonal ....(19) *Automalus* Wesmael.
(Type, *Trogus alboguttatus* Gravenhorst.)

Scutellum flat or subconvex, the metanotum not elevate, the areola distinct; female antennæ slightly flattened beyond the middle; metanotum not short.

Areola horse-hoof shaped, a little longer than wide; basal lateral and middle lateral areas confluent ...(20) *Protichneumon* Thomson.
(Type, *Ichneumon fusorius* Linnæus.)

Areola not distinctly horse-hoof shaped, a little wider than long; basal lateral and middle lateral areas separated.
(21) *Cœlichneumon* Thomson.
Type, *Ichneumon lineator* Gravenhorst.

12. Antennæ in female very slightly widened 13

Antennæ in female distinctly lanceolate.

Areolet tetragonal, pyramidal; metathorax very short, strongly declivous; the areola very short ....(22) *Catadelphus* Wesmael.
(Type, *Ichneumon arrogator* Fabricius.)

Areolet irregularly pentagonal or nearly trapezoidal, the veins sometimes curved, as in *Dinotomus* Förster.
(23) *Camarota* Kriechbaumer.
(Type, *Camarota thoracica* Kriechbaumer.)

Areolet pentagonal; scutellum margined laterally and posteriorly; head almost quadrate; abdomen narrow.
(24) *Ischnojoppa* Kriechbaumer.
(Type, *Joppa lutea* Fabricius.)

13. Scutellum convex, with lateral ridges at base; areolet irregularly pentagonal; metathorax areolated; abdomen strongly punctate, the segments 2–5 constricted at the sutures.
(25) *Trogomorpha* Ashmead, new genus.
(Type, *Ichneumon trogiformis* Cresson.)

Scutellum saddle-shaped; i. e., pyramidal, with an emargination at apex; metathorax exareolated; abdomen aciculate and rugulose.
(26) *Microsarge* Kriechbaumer.
(Type, *Microsarge sieberi* Kriechbaumer.)

Scutellum cushion-shaped, surrounded by a distinct, elevated margin, the field thus formed nearly horse-hoof shaped; metathorax exareolated, the hind angles rounded, with only a small tubercle; abdomen finely punctate-rugulose; all tarsi long, as long or a little longer than their femora. Female...(27) *Hoplojoppa* Kriechbaumer.
(Type, *Hoplojoppa parvispina* Kriechbaumer.)

Scutellum thorn-shaped; metathorax areolated as in *Ichneumon;* abdomen rather flat, subclavate, finely and moderately regularly aciculate and rugulose; female antennæ scarcely perceptibly widened ....(28) *Stenolonche* Kriechbaumer.
(Type, *Stenolonche areolata* Kriechbaumer.)

14. Labrum prominent, distinct; metathoracic spines very large; scutellum flat and margined to beyond the middle, the margins anteriorly acutely elevated; areolet pentagonal; submedian cell a little longer than the median, the disco-cubital vein broken at the middle by a slight stump of a vein.... (29) *Cryptojoppa* Kriechbaumer.
(Type, *Cryptojoppa semicastanea* Kriechbaumer.)

Labrum hidden; metathoracic spines small.

Head transverse, the temples not especially broad; scutellum saddle-shaped, emarginate above; areolet pentagonal or nearly trigonal; antennæ feebly dilated............(30) *Eccoptosarge* Kriechbaumer.
(Type, *Eccoptosarge Waagenii* Kriechbaumer.)

Head large, swollen, the occiput deeply concave; scutellum very broad, subquadrate, more or less elevated, and margined at the sides, unituberculate, or with a small spine above; areolet rather small, pentagonal, the median and submedian cells of an equal length; gastrocœli very large transverse.
(31) *Œdicephalus* Cresson.
(Type, *Œdicephalus longicornis* Cresson.)

Head transverse, or subquadrate; scutellum cushion-shaped, convex, and margined; areolet trapezoidal; metathorax exareolated. (Male).
(27) *Hoplojoppa* Kriechbaumer.
(Type, *Hoplojoppa parvispina* Kriechbaumer.)

Tribe II. ICHNEUMONINI.

1868. *Ichneumonoidæ*, Family 29, Förster, Verh. d. naturh. Ver. pr. Rheinl., XXV, pp. 144 and 149.
1894. *Ichneumonini*, Tribe II, Ashmead, Proc. Ent. Soc., Wash., III, p. 278.
1900. *Ichneumonini*, Tribe II, Ashmead, Smith's Insects of New Jersey, p. 564.

As previously stated, this tribe is scarcely separable from some forms belonging to the *Joppini*, and it requires considerable care and the closest scrutiny for the detection of the metathoracic differences, used in my table of tribes, before one can be sure of the position of certain forms. It is clearly connected with the *Joppini* by the genus *Amblyteles* and allied genera through *Protichneumon*, *Cœlichneumon*, and *Automalus*.

The tribe is, however, easily separated from the others: The simple, non-pectinate claws separate it from the *Listrodromini*, the bidentate mandibles from the *Heresiarchini*, while the large, elongate or linear spiracles distinguish it from the *Alomyini* and the *Phæogenini*.

The genera may be distinguished by the use of the following table:

TABLE OF GENERA.

Basal third of petiole flattened, wider than thick dorso-ventrally 8

Basal third of petiole *not* flattened, or so little that it is *not* wider than thick dorso-ventrally.

Abdomen in female with its tip blunt, the last ventral segment covering the base of the borer (*Amblypygi*)...................................... 5

Abdomen in female with its tip pointed, *not* blunt, the last ventral segment *not* covering the base of the borer (*Oxypygi*).................... 2

2. Scutellum not short, convexly elevated and declivous posteriorly, not margined laterally; metathorax with the upper hind angles usually dentate, the areola wider than long.
(32) *Hoplismenus* Gravenhorst.
(Type, *Hoplismenus perniciosus* Gravenhorst.)

Scutellum short, subconvex, rounded posteriorly and margined laterally, metathorax unarmed, the areola narrow, curved and much broader than long............................(33) *Callimus* Tosquinet.
(Type, *Callimus adornatus* Tosquinet.)

Scutellum usually flat, never much elevated nor highly declivous posteriorly.

Clypeus medially on the anterior margin *not* emarginate or sinuate, either truncate or slightly rounded 3

Clypeus medially on the anterior margin, emarginate or sinuate; metathorax with the areola elongate rectangular, the labrum more or less exposed; ciliate; antennæ filiform.

(34) *Chasmias* Ashmead, new name.
= *Chasmodes* Wesmael *nec* Cuvier et Valenciennes.
(Type, *Ichneumon notatorius* Gravenhorst.)

3. Ovipositor and sheaths *not* or only slightly extending beyond the tip of the abdomen 4

Ovipositor and sheaths thickened and extending beyond the tip of the abdomen.

Antennæ filiform; metathorax with the areola large, nearly hexagonal; eighth dorsal abdominal segment exserted.

(35) *Exephanes* Wesmael.
(Type, *Ichneumon hilaris* Gravenhorst.)

4. Second abdominal segment cask-shaped, the sutures between segments 2, 3, and 4 very deep .... (36) *Pithotomus* Kriechbaumer.
(Type, *Pithotomus rifiventris* Kriechbaumer.)

Second abdominal segment normal, *not* cask-shaped, trapezoidal, or rectangular.

Abdomen subdepressed, the petiole feebly bent.

(37) *Diphyus* Kriechbaumer = *Diphyes* Kriechbaumer.
(Type, *Diphyes tricolor* Kriechbaumer.)

Abdomen convex, the petiole strongly curved or bent at the posterior third;

Anterior tarsi in female somewhat dilated... (38) *Eupalamus* Wesmael.
(Type, *Eupalamus oscillator* Wesmael.)

Anterior tarsi in female normal.

Areola of metanotum quadrate or nearly, the basal lateral and the middle lateral areas confluent; post petiole scabrous or rugulose; flagellar joints 2–4 in female three or more times longer than thick.

(39) *Stenichneumon* Thomson.
(Type, *Ichneumon pisorius* Linnæus.)

Areola of metanotum quadrate, usually a little longer than wide, the hind margin curved inwardly or more or less angularly emarginate, the basal lateral and the middle lateral areas usually, but not always, separated; post petiole aciculate; flagellar joints 2–4 in female short, scarcely or not much longer than thick.

(40) *Ichneumon* Linnæus.
(Type, *Ichneumon luctatorius* Linnæus.)

Areola of metanotum large, hexagonal or subquadrate, the basal lateral and the middle lateral areas usually separated; post petiole punctate; flagellar joints 2–4 in female subequal, longer than thick .... (41) *Melanichneumon* Thomson.
(Type, *Ichneumon spectabilis* Holingren.)

Areola of metanotum horse-hoof shaped or nearly, a little wider than long, or cordate, the basal lateral and the middle lateral areas complete; antennæ in female stout; flagellar joints 2–4 longer than thick .... (42) *Cratichneumon* Thomson.
(Type, *Ichneumon luteiventris* Thomson.)

Areola of metanotum nearly semicircular, wider than long, the basal lateral and middle lateral areas separated; head subquadrate; antennæ and legs stout; flagellar joints 2–4 in female quadrate or nearly, not or scarcely longer than wide.

(43) *Barichneumon* Thomson.
(Type, *Ichneumon anator* Gravenhorst.)

5. Abdomen in female very long and much compressed toward apex.
(44) *Limerodes* Wesmael.
(Type, *Limerodes ophionoventris* Wesmael.)
Abdomen in female neither especially long nor compressed toward apex.
Abdomen in female with 7 dorsal segments; joints 12–16 of male antennæ not widened.. 6
Abdomen in female with 8 dorsal segments; joints 12–16 of male antennæ somewhat widened.
Scutellum normal.
Metathorax unarmed, the spirales oval; abdomen very slender.
(45) *Hypomecus* Wesmael.
(Type, *Hypomecus albitarsis* Wesmael.)
Metathorax normal, bispinose, or bidentate, the spirales elongate or linear; abdomen not slender; male antennæ slender, the joints nodulose beneath.
Abdomen without ventral fold, except sometimes on first segment; gastrocœli and thyridia large, deep, broader than the space between; seventh segment in both sexes black; areola of metanotum in outline circular with its apex truncate.
(46) *Ctenichneumon* Thomson.
(Type, *Amblyteles funereus* Gravenhorst.)
Abdomen with ventral fold on segments 1 and 2 or 1 to 3; gastrocœli and thyridia small or moderate.
Mesosternal epicnemia entire; dorsal abdominal segments 6 and 7 spotted with white or yellow; hypopygium large, almost entirely covering the terebra; third ventral segment rarely with a fold............(47) *Spilichneumon* Thomson.
(Type, *Amblyteles occisorius* Gravenhorst.)
Mesosternal epicnemia not entire; anus usually pale; hypopygium usually not attaining the terebra; third ventral segment usually with a fold.
Upper hind angles of metathorax unarmed.
(48) *Pseudamblyteles* Ashmead, new genus.
(Type, *Amblyteles palliatorius* Gravenhorst.)
Upper hind angles of metathorax distinctly bispinose or bidentate....................(49) *Amblyteles* Wesmael.
(Type, *Ichneumon bidentorius* Fabricius=*fasciatorius* Wesmael.)
Scutellum gibbous; metathorax bidentate; abdomen short, oval.
(50) *Hybophorus* Kriechbaumer.
(Type, *Ichneumon aulacus* Gravenhorst.)
6. Pronotal furrow normal, *not* interrupted medially by an elevation or keel... 7
Pronotal furrow interrupted medially by an elevation or keel.
(51) *Anisobus* Wesmael.
(Type, *Ichneumon cingulatorius* Wesmael.)
7. Tarsi on the underside pilose, *without* or with very small spines.
Metathorax with the areola longer than wide.
(52) *Hepiopelmus* Wesmael.
(Type, *Ichneumon leucostigmus* Gravenhorst.)
Tarsi on the underside pilose, *with* strong spines.
Clypeus anteriorly strongly rounded and medially toothed or angulated.
(53) *Acolobus*, Wesmael.
(Type, *Acolobus sericeus* Wesmael.)

Clypeus anteriorly straight, truncate.
  Scutellum quadrate; antennal joints 12-16 dilated laterally. Male.
(45) *Hypomecus* Wesmael.
(Type, *Hypomecus albitarsis* Wesmael.)
  Scutellum not quadrate; antennal joints 12-16 not dilated laterally.
    Metathorax bidentate ....(49) *Amblyteles* Wesmael.
    Metathorax unarmed...............(48) *Pseudamblyteles* Ashmead.

8. First abdominal segment at the elbow much swollen, gibbous, or angulated.
(54) *Probolus* Wesmael.
(Type, *Ichneumon fossorius* Gravenhorst.)
First abdominal segment at the elbow *not* gibbous or angulated.
  Scuttellum pyramidal......................(55) *Pyramidophorus* Tischbein.
(Type, *Pyramidophorus flavoguttatus* Tischbein.)
  Scutellum not pyramidal.
    Antennæ very strongly serrate. Male...(56) *Pristocerus* Gravenhorst.
(Type, *Pristocerus serrarius* Gravenhorst.)
    Antennæ not strongly serrate.
      First abdominal segment neither broad nor rugose its entire length 9
      First abdominal segment very broad and wholly rugose.
(57) *Rhyssolabus* Kriechbaumer.
(Type, *Platymischos brassicus* Tischbein.)

9. Areolet pentagonal (rarely subtriangular and briefly petiolate in some males.)
  Scutellum laterally margined at the most only at the base, never to the middle.
    Front tarsi *without* a single joint armed with fine spines.
(58) *Eurylabus* Wesmael.
(Type, *Eurylabus torvus* Wesmael.)
    Front tarsi *with* most of the joints armed with fine spines.
(59) *Eristicus* Wesmael.
(Type, *Ichneumon clericus* Gravenhorst.)
  Scutellum laterally margined to beyond the middle. (60) *Platylabus* Wesmael.)
(Type, *Platylabus rufus* Wesmael.)

Tribe III. LISTRODROMINI.

1868. *Listrodromoidæ*, Family 32, Förster, Verh. d. naturh. Ver. pr. Rheinl., XXV, pp. 144 and 194.

1894. *Listrodromini*, Tribe IV, Ashmead, Proc. Ent. Soc. Wash., III, p. 278.

The species belonging to this tribe have the claws pectinate, never simple; otherwise they are scarcely distinguishable from those found in the *Joppini* and the *Ichneumonini*.

Förster placed in the group only two genera, *Neotypus* and *Listrodromus*, while I have ventured to place here five other genera.

TABLE OF GENERA.

Metathoracic spiracles, round or oval 4
Metathoracic spiracles, large, elongate, forming a long slit, sometimes curved.
  Scutellum flat, or at most subconvex, never gibbous or elevated 2
  Scutellum elevated at apex and highly declivous; metathorax normal, unarmed.
(61) *Ctenochares* Förster.

Scutellum gibbous with lateral carinæ; metathorax bidentate, exareolate.
(62) *Joppites* Berthoumieu = *Celmis* Tosquinet = *Pseudojoppa* Kreichbaumer.

2. Metathorax normal, unarmed 3

Metathorax bispined or bidentate.

Spiracles of abdominal segments elongate or oval; metathorax *not* or very indistinctly areolated; submedian cell *not* longer than the median; disco-cubital nervure broken by a stump of a vein; areolet with the sides strongly convergent above, triangular or rhomboidal; abdomen banded, the ovipositor subexserted.
(63) *Cressonianus* Ashmead, new genus.
(Type, *Patroclus lectus* Cresson.)

3. Metathorax *not* short, *not* or very indistinctly areolated; submedian cell a little *longer* than the median; disco-cubital nervure broken by a stump of a vein; areolet pentagonal; scutellum margined at sides anteriorly; abdomen blue or black, not banded, the spiracles of the first segment large, subreniform; claws with long teeth.............(64) *Patroclus* Cresson.
(Type, *Patroclus nigrocæruleus* Cresson.)

Metathorax short, truncate posteriorly and distinctly areolated; submedian cell a little *shorter* than the median, or never longer; disco-cubital nervure not broken by a stump of a vein; areolet regularly pentagonal; scutellum margined at sides clear to the apex; abdomen not wholly blue or black, the spiracles of the first segment very small, rounded; claws with shorter teeth at base only (sometimes difficult to discern).
(65) *Neotypus* Förster.
(Type, *Ichneumon lepidator* Fabricius.)

4. Metathoracic spiracles oval, the metanotum exareolated; scutellum flat, longer than wide, with elevated lateral margins........(66) *Eradha* Cameron.
(Type, *Eradha trichiosoma* Cameron.)

Metathoracic spiracles round, the metanotum areolated; scutellum pyramidal.
(67) *Listrodromus* Wesmael.
(Type, *Ichneumon nyctermerus* Gravenhorst.)

Tribe IV. HERESIARCHINI.

1900. *Heresiarchini*, Tribe IV, ASHMEAD, Smith's Insects of New Jersey, p. 567.

This tribe is proposed for certain genera having the mandibles simple, edentate and acute at apex, and this simple character readily distinguishes the group from all others.

Four genera belong here, separable as follows:

TABLE OF GENERA.

Metathorax normal, unarmed 2

Metathorax bidentate.

Head large, strongly concave behind the temples, the cheeks full, buccate; transverse median nervure in front wings interstitial; disco-cubital nervure broken by a stump of a vein before the middle; antennæ broadly ringed with white....... (68) *Plagiotrypes* Ashmead, new genus.
(Type, *Ichneumon concinnus* Say.)

2. Metathorax with the areola semicircular, smooth, and shining; scutellum *not* margined laterally to beyond the middle; second abdominal segment with the gastrocœli linear and placed longitudinally.
(69) *Heresiarches* Wesmael.
(Type, *Heresiarches eudoxius* Wesmael.)

Metathorax with the areola *not* semicircular; scutellum margined laterally to beyond the middle; second abdominal segment with the thyridia occupying the entire breadth and scarcely separated at the middle.
(70) *Rhexidermus* Förster.
(Type, unknown.)

Metathorax with the basal median and basal lateral areas confluent; scutellum margined laterally only at base; second abdominal segment with the thyridia widely separated at the middle.
(71) *Stenodontus* Berthoumieu. (=*Gnathoxys* Wesmael.)
(Type, *Ichneumon marginellus* Gravenhorst.)

Tribe V. ALOMYINI.

1844. *Ichneumones heterogastri* Wesmael, Nouv. Mém. Acad. Sci. Brux., XVIII, p. 217.
1868. *Alomyoidæ*, Family 31, Förster, Verh. d. naturh. Ver. pr. Rheinl., XXV, pp. 144 and 194.
1894. *Alomyini*, Tribe III, Ashmead, Proc. Ent. Soc. Wash., III, p. 278.

I have followed Förster in retaining this group as distinct from the *Ichneumonini*, where some authorities would place it, or from the *Phæogenini*, where others would place it. To me it seems to approach nearest to the *Phæogenini*, but is readily separated by its metanotal characters and by the shape of the metathoracic spiracles.

Only a single genus is known in the group, distinguishable as follows:

Form elongate; metathorax smooth, exareolated, the spiracles large, oval; abdomen elongate, smooth and polished, the sides parallel, the second segment *without* gastrocœli; antennæ with the joints of the flagellum short, in female not or scarcely twice as long as wide, in male the joints, except the first, not longer than wide; head quadrate .... (72) *Alomya* Panzer.
(Type, *Alomya ovata* Panzer.)

Tribe VI. PHÆOGENINI.

1868. *Phæogenoidæ*, Family 30, Förster, Verh. d. naturh. Ver. pr. Rheinl., XXV, pp. 144 and 191.
1894. *Phæogenini*, Tribe V, Ashmead, Proc. Ent. Soc. Wash., III, p. 278.
1898. *Cyclopneustici*, Subtribe, Berthoumieu, Ann. Soc. Ent. France, LXV, p. 332.
1900. *Phæogenini*, Tribe VI, Ashmead, Smith's Insects of New Jersey, p. 568.

To this tribe belong a large number of the smaller ichneumonids, separated at once from those in the other tribes by the small, rounded, or circular metathoracic spiracles.

It is believed that the genera falling here can be readily distinguished by the use of the following table:

TABLE OF GENERA.

Scutellum *not* especially elevated 2
Scutellum very convex and elevated.
Tip of abdomen acute, the ovipositor quite straight; head transverse-quadrate, the temples as wide as the eye; lunulæ large transverse, more or less confluent.................................. (73) *Ischnus* Gravenhorst.
(Type, *Ischnus thoracicus* Gravenhorst.)

Tip of abdomen very obtuse, the ovipositor curving upward.
(74) *Heterischnus* Wesmael.
(Type, *Ichneumon pulex* Müller.)

2. Superior hind angles of metathorax normal, *not* toothed 3
Superior hind angles of metathorax prominently toothed; clypeus subquadrate.
(75) *Apæleticus* Wesmael.
(Type, *Apæleticus bellicosus* Wesmael.)

3. Spiracles of first abdominal segment placed at the middle.
(76) *Diacritus* Förster.
Spiracles of first abdominal segment placed behind the middle.
Metathorax *not* produced at apex beyond the base of hind coxæ........ 4
Metathorax much lengthened and at apex produced beyond the base of the hind coxæ.
Clypeus convex, not separated from the face at base; abdomen not compressed at the apex ....(77) *Oronotus* Wesmael.
(Type, *Oronotus coarctatus* Wesmael.)
Clypeus depressed, separated from the face by a deep furrow; abdomen compressed at apex ....(78) *Diaschisaspis* Förster.
(Type, *Diaschisaspis campoplegoides* Holmgren.)

4. Second abdominal segment with the lunulæ small, never twice as long as broad; metanotum *not* sloping gradually from base to apex 5
Second abdominal segment with the lunulæ very large, linear, twice as long as broad; metanotum gradually sloping from base to apex; areolet open or closed........................(79) *Hemichneumon* Wesmael.
(Type, *Hemichneumon suspectus* Wesmael.)

5. Areolet open behind; marginal cell along the costa scarcely longer than the triangular stigma; transverse median nervure in hind wings straight, *not* broken................................(80) *Epitomus* Förster.
(Type, *Epitomus parvus* Thomson.)
Areolet closed.
Clypeus unarmed, *without* a tooth at apex................................ 6
Clypeus *with* a tooth at apex. Upper tooth of the mandibles longer than the lower; transverse median nervure in hind wings broken below the middle......................................(81) *Misetus* Wesmael.
(Type, *Misetus oculatus* Wesmael.)

6. Clypeus at apex *with* a median semicircular emargination; mandibles with the teeth very unequal ....(82) *Oiorhinus* Wesmael.
(Type, *Oiorhinus pallipalpis* Wesmael.)
Clypeus at apex *without* such an emargination.
Clypeus at apex medially *without* a fovea 7
Clypeus at apex medially *with* a deep depression or fovea which often appears laterally as two small, blunt teeth; abdomen shagreened or densely coriaceous and finely punctate; mandibles rather large, the teeth subequal; transverse median nervure in hind wings broken very little below the middle ....(83) *Æthecerus* Wesmael.
(Type, *Æthecerus dispar* Wesmael.)

7. Discoidal transverse nervure wanting ....(84) *Tycherus* Förster.
Discoidal transverse nervure present.
Second abdominal segment *without* distinct gastrocœli at base 8
Second abdominal segment *with* distinct gastrocœli at base.
Metathorax at apex not produced beyond insertion of hind coxæ.
Scape of antennæ only slightly emarginate, longer than the first joint of flagellum..................(85) *Herpestomus* Wesmael.
(Type, *Ichneumon brunnicornis* Gravenhorst.)

Scape of antennæ very deeply emarginate, shorter or no longer than the first joint of flagellum...........(86) *Diadromus* Wesmael.
(Type, *Ichneumon troglodytes* Gravenhorst.)
Metathorax at apex produced somewhat beyond the insertion of hind coxæ ....(87) *Thyræella* Holmgren.
(Type, *Ischnus collaris* Gravenhorst.)

8. Second segment with the thyridia more or less distinct 13
Second segment *without* a trace of thyridia or the same are unusually small and indistinct.
Mandibles in female at base beneath not emarginate 9
Mandibles in female at base beneath emarginate.
(88) *Colpognathus* Wesmael.
(Type, *Ichneumon celerator* Gravenhorst.)

9. Head quadrate or nearly, the temples broad.................................. 11
Head transverse, not nearly quadrate.
Metanotum with the areola lengthened, *not* cordate..................... 10
Metanotum with the areola cordate or reniform.
(89) *Dicœlotus* Wesmael (=*Dicœlus* Wesmael=*Cinxœlotus* Holmgren).
(Type, *Ichneumon pumilus* Gravenhorst.)

10. Scutellum margined laterally to the tip..................(90) *Holocrepis* Förster.
Scutellum *not* marginal laterally to the tip; at the most margined only at the base................... ....(91) *Deloglyptus* Förster.
(Type, *Deloglyptus punctiventris* Thomson.)

11. Clypeus twice as wide as long; first abdominal segment somewhat longer than the second; flagellum in male very slender at base.............. 12
Clypeus scarcely broader than long; first abdominal segment in female shorter than the second, in male about one-half as long.. (92) *Micrope* Förster.
(Type, *Phæogenes macilentus* Wesmael.)

12. Face much shortened; scape twice as long as the first joint of flagellum.
(93) *Eparces* Förster.
(Type, *Eparces quadriceps* Thomson.)
Face not much shortened; scape stout, globose.
First joint of flagellum rarely longer than thick, shorter than the second; transverse median nervure in hind wings broken *below* the middle.
(94) *Centeterus* Wesmael.
(Type, *Centeterus major* Wesmael.)
First joint of flagellum elongate, three or more times longer than thick, and longer than the second; transverse median nervure in hind wings broken *above* the middle...............(95) *Pœcilostictus* Ratzeburg.

13. Mesonotum and scutellum *not* wholly flattened 14
Mesonotum and scutellum wholly flattened, the postscutellum smooth, shining.
Metanotum *with* a distinctly circumscribed areola.... (96) *Eriplatys* Förster.
(Type, *Harpestomus ardeicollis* Wesmael.)
Metanotum *without* an areola ....(97) *Anopiesta* Förster.

14. Second abdominal segment with two foveæ at base; metathorax *not* areolated.
(98) *Nematomicrus* Wesmael.
Second abdominal segment with thyridia only at base; metathorax areolated.
Thyridia lying close to the base and indistinct; postpetiole broad, strongly punctured; clypeus thickly punctured......(99) *Bæosemus* Förster.
(Type, *Ichneumon mitigosus* Gravenhorst.)
Thyridia *not* lying close to the base and usually large; postpetiole *not* broad nor strongly punctured; clypeus not thickly punctured.
Postpetiole very short, scarcely one-fourth the length of the petiole;

thyridia very large and broad, placed far beyond the base and only a little before the middle of the segment.

Head quadrate; areola pentgonal or nearly; abdomen shagreened or punctate basally. .... (100) *Notosemus* Förster.
(Type, *Notosemus Bohemani* Wesmael.)

Head subglobose; areola of metanotum semicircular; abdomen smooth .... (101) *Mavesia* Holmgren.
(Type, *Phæogenes argutus* Wesmael.)

Head not quadrate, at most subquadrate; postpetiole not very short; thyridia placed tolerably close to the base of the segment; clypeus completely separated from the face.

Cheeks not buccate; the clypeus truncate or slightly rounded anteriorly .... (102) *Phæogenes* Wesmael.
(Type, *Ichneumon semivulpinus* Gravenhorst.)

Cheeks buccate; the clypeus very short bisinuate anteriorly.
(103) *Proscus* Holmgren.
(Type, *Phæogenes cephalotes* Wesmael.)

Subfamily II. CRYPTINÆ.

1868. *Cryptoidæ*, Family 26, Förster (part), Verh. d. naturh. Ver. pr. Rheinl., XXV, pp. 144 and 186.
1873. *Cryptidæ*, Family, Thomson, Opus Ent., V, p. 467.
1887. *Cryptinæ*, Subfamily, Cresson, Syn. Hym. North America, p. 42.
1888. *Cryptidæ*, Family, Thomson, Opus Ent., XII, p. 1236.
1900. *Cryptinæ*, Subfamily II, Ashmead, Smith's Insects of New Jersey, p. 568.

This subfamily, with the exception of possibly the *Ichneumoninæ*, can be easily separated from all the others by the characters made use of in my table of subfamilies. With the subfamily mentioned, however, it is different, since the species falling in it are exceedingly closely allied, and the males especially are separated, or placed, with difficulty. The females, however, may be easily distinguished, except in a few cases, by the prominent, exserted ovipositor, and the position of the spiracles of the first abdominal segment.

Both sexes, however, possess a character not found in the *Ichneumoninnæ*, viz, *a more or less distinct, longitudinal grooved line or furrow, sometimes punctate or crenulate, situated low down on the mesopleura and which separates the mesosternum from these sclerites.* This character may always be depended upon to separate a cryptine from an ichneumonine.

Seven distinct minor groups, or tribes, may be distinguished, separated as follows:

TABLE OF TRIBES.

Metathorax *without* distinct longitudinal carinæ or at the most with only the pleural carinæ present, the petiolar area always wanting, usually with one or two transverse carinæ or with none; stigma most frequently narrowed, lanceolate; apterous and subapterous forms common 2

Metathorax *with* longitudinal carinæ and usually more or less completely areolated, the petiolar area present; stigma usually widened, triangular, subtriangular, or ovate; subapterous forms rare.

Metathorax usually produced beyond the insertion of hind coxæ, the petiolar area and the areola usually confluent and extending clear to the base; ovipositor very short, at the most subexserted. Tribe I. STILPNINI.

Metathorax not produced beyond the hind coxæ; ovipositor exserted.

Front wings with a complete areolet; head usually quadrate; antennæ and legs most frequently stout .... Tribe II. PHYGADEUONINI.

Front wings with the areolet incomplete, open behind or wanting; head *not* or rarely quadrate; antennæ and legs usually slender.

Basal nervure not strongly curved inwardly....Tribe III. HEMITELINI.

Basal nervure strongly curved inwardly.......Tribe IV. PEZOMACHINI.

2. Wings fully developed.. 3

Wings absent or abbreviated ....Tribe IV. PEZOMACHINI.

Metanotum not areolated..........................Tribe IV. PEZOMACHINI.

3. Front wings with the stigma narrowed, the areolet variable, pentagonal, or small quadrate, sometimes almost punctiform, more rarely open behind or entirely absent; discoidal cell with the lower apical angle straight or obtuse, the basal nervure *not* strongly curved inwardly; abscissa of costa long 4

Front wings with the stigma broad, triangular, the areolet pentagonal in position but open behind, the basal nervure strongly curved inwardly; abscissa short. (Male.)..................Tribe IV. PEZOMACHINI.

4. Areolet entirely wanting...........................Tribe V. HEMIGASTERINI.

Areolet distinct, usually large, never very small, and always pentagonal, the sides convergent above or parallel............Tribe VI. CRYPTINI.

Areolet small, quadrate, sometimes almost punctiform, sometimes open behind, but never pentagonal in position.........Tribe VII. MESOSTENINI.

Tribe I. STILPNINI.

1868. *Stilpnoidæ*, Family 28, FÖRSTER, Verh. d. naturh. Ver. pr. Rheinl., XXV, pp. 144 and 188.
1873. *Stilpnina*, Tribes, THOMSON, Opus Ent., V, p. 468.
1884. *Stilpnina*, Tribes, THOMSON, Opus Ent., X, p. 1018.
1894. *Stilpnini*, Tribe I, ASHMEAD, Proc. Ent. Soc. Wash., III, p. 278.
1900. *Stilpnini*, Tribe I, ASHMEAD, Smith's Insects of New Jersey, p. 568.

This group is of small extent and at one time, on account of the brevity of the ovipositor, was confused and classified with the genuine Ichneumonines; but from these it is at once separated by the longituninal furrow which separates the mesosternum from the mesopleura.

The tribe is distinguished from the others in this subfamily not only by the non-exserted, or at most, subexserted ovipositor, but also by its metathoracic characters. All, except two or three of the genera, have the metathorax long, gradually sloping from base to apex, and produced posteriorly beyond the insertion of the hind coxæ, with the areola and the petiolar area confluent, extending to, or almost to, its base.

Most of the species, too, are highly polished and have the abdomen long, more or less compressed, rarely short or broad, while the areolet in the front wings, although sometimes closed and pentagonal, is most frequently wanting or open.

Eight genera are placed here, distinguished as follows:

TABLE OF GENERA.

Fourth abdominal segment and the following *not* at all or only slightly compressed; if much compressed, compressed from the second segment, the incisions always distinctly visible 2

Fourth abdominal segment and those following very strongly compressed, the incisions scarcely visible .... (104) *Seleucus* Holmgren.
(Type, *Seleucus cuneiformis* Holmgren.)

2. Third joint of flagellum strongly excised .... (105) *Zetisima* Förster.
(Type, *Zetisima rufipes* Förster.)

Third joint of flagellum *not* excised.

Areolet closed at apex, or, if open, the abdomen much lengthened 3

Areolet open at apex, the abdomen rounded or oval; antennæ 17–18-jointed.
(106) *Xestophya* Förster.
(Type, *Xestophya fallax* Förster.)

3. Second abdominal segment in female from the base and beyond *not* much compressed, the postpetiole not entirely smooth and shining 4

Second abdominal segment from the base and all the following segments much compressed from the sides, the petiole entirely smooth, shining, the postpetiole scarcely wider than the petiole; second segment longer than wide at apex; metanotum with the external and median lateral areas confluent .... (107) *Asyncrita* Förster.
(Type, *Atractodes foveolatus* Gravenhorst.)

4. Antennæ in female 16–17-jointed, in male 19–23-jointed; pronotum anteriorly uncovered .... (108) *Stilpnus* Gravenhorst.
(Type, *Stilpnus gagates* Gravenhorst.)

Antennæ in female more than 17-jointed; pronotum covered.

Abdomen in female either lengthened or somewhat compressed from the sides, the second segment more or less rounded laterally; areolet either closed or open behind 5

Abdomen in female compressed laterally, also not strongly lengthened, the second segment laterally not rounded, much widened toward apex; spiracles of the first and second segments in males and females not really visible from above .... (109) *Polyrhembia* Förster.

5. Abdomen in female not compressed laterally, *with* a distinct ventral fold; middle vein in hind wings obliterated at base in both sexes; petiole and postpetiole in male smooth, shining, and longer than the coxæ and trochanters; second segment with thyridia; areolet open.
(110) *Exolytus* Holmgren.
(Type, *Mesoleptus lævigator* Gravenhorst.)

Abdomen in female much compressed laterally, *without* a ventral fold; middle vein in hind wings distinct in both sexes; petiole in male more or less coriaceous or rugulose, *not* longer than the coxæ and trochanters; areolet wanting or open .... (111) *Atractodes* Gravenhorst.
(Type, *Atractodes bicolor* Gravenhorst.)

Tribe II. PHYGADEUONINI.

1868. *Phygadeuontoidæ*, Family 25, FÖRSTER, Verh. d. naturh. Ver. pr. Rheinl., XXV, pp. 144 and 181.
1873. *Phygadeuonina*, THOMSON, Opus. Ent., V., pp. 468 and 517.
1894. *Phygadeuonini*, Tribe III, ASHMEAD, Proc. Ent. Soc. Wash., III, p. 278.
1900. *Phygadeuonini*, Tribe II, ASHMEAD, Smith's Insects of New Jersey, p. 568.

This group is undoubtedly the largest and probably the most difficult to study and classify of all the tribes in this subfamily, and I am by no means satisfied that, as at present constituted, it is a natural group, or that it can always be kept separate from the *Hemitelini*. In fact, I am inclined to believe, from studies thus far made in the two groups, that some of the forms now placed in the *Hemitelini* really belong here, and that the closed or open areolet will not always prove a reliable character to separate them, although typical forms are readily separated by it.

For the present, however, or until a larger and better collection can be brought together, I prefer to treat these two tribes in the Försterian sense.

About 51 genera are now recognized in the tribe, separable as follows:

TABLE OF GENERA.

Wings normal, not abbreviated.................................... 3
Wings abbreviated.
  Wings *with* a closed marginal cell.................................... 2
  Wings *without* a marginal cell.
    Basal nervure present; metanotum incompletely areolated, the apical transverse carina distinct, complete.......... (112) *Stibeutes* Förster.
      (Type, *Stibeutes gravenhorstii* Förster.)
    Basal nervure absent; metanotum not areolated, the apical transverse carina incomplete.......................... (113) *Pezoporus* Förster.
      (Type, *Pezomachus nigrocinctus* Gravenhorst.)
2. Wings *with* a basal nervure; metathorax completely areolated.
      (114) *Phyrtus* Förster.
      (Type, *Hemiteles hemipterus* Gravenhorst.)
  Wings *without* a basal nervure...................... (115) *Chamæzelus* Förster.
3. First three joints of flagellum *not* especially lengthened, or at least not the third; in female scarcely more than twice, or at most thrice, as long as thick; in male rarely more than thrice as long as thick at apex.. 8
  First three joints of flagellum much lengthened; the first and second at least four times as long as wide at apex, or longer, the third fully three or more times longer than thick.................... 4
4. Sides of the face clothed with a glittering or silvery white pubescence; parapsidal furrows deep and extending at least to the middle of the mesonotum.. 5
  Sides of the face *not* clothed with a glittering white pubescence; parapsidal furrows wanting or indistinct, at the most feebly indicated anteriorly.. 6

5. Transverse median nervure in hind wings *not* broken. (116) *Thysiotorus* Förster.

Transverse median nervure in hind wings broken.

Disco-cubital nervure straight or slightly curved, but not angularly broken.

Abdomen scarcely longer than the head and thorax united, the second segment at apex thrice as wide, or nearly, as long. (117) *Apsilops* Förster.

Abdomen longer than the head and thorax united, the second segment longer than wide at apex; areolet with the sides convergent above.

Metathoracic spiracles large, long elliptical (male) (see p. 29). (126) *Plectocryptus* Thomson.

Metathoracic spiracles small, short oval or subrotund (male) (see p. 29) ....(127) *Microcryptus* Thomson.

Disco-cubital nervure angularly broken.

Abdomen elongate, much longer than the head and thorax united, the second segment *not* twice as wide as long, not much more than half the length of the segment...... (118) *Panargyrops* Förster.

6. Metathorax regularly areolated, more or less rugolose, or coriaceous, and frequently opaque.. 7

Metathorax areolated, but quite smooth and shining.

First abdominal segment *with* dorsal carinæ; metathorax with *five* areas at apex................................(119) *Leptodermas* Förster.

First abdominal segment *without* dorsal carinæ; metathorax with *three* areas at apex ....(120) *Oxytænia* Förster.

7. Radius originating before the middle of the stigma; disco-cubital cell at base as wide as the second discoidal cell at apex..(121) *Isotima* Förster.

Radius originating from the middle of the stigma; disco-cubital cell at base nearly twice as wide as the second discoidal cell at apex.

Transverse median nervure in hind wings obtusely angularly broken a little above the middle; petiole long, almost straight, *not* elbowed or much widened at apex...........(122) *Acroricnus* Ratzeburg.

Transverse median nervure in hind wings straight and broken by the subdiscoidal nervure far below the middle; petiole bent and widened at apical third ....(123) *Stiboscopus* Förster.

8. Dorsal carinæ of first abdominal segment extend from the base to the spiracles, but not beyond 9

Dorsal carinæ of first abdominal segment extend from the base to beyond the spiracles, but rarely to the tip of the segment; if not, then antennæ in female compressed or flattened between the middle and the apex 10

9. Hind tibiæ deeply incised at apex, the tarsi attached below the tip.

Metanotum areolated, the areola wider than long; hind tibiæ spinulose. (124) *Glyphicnemis* Förster.

(Type, *Phygadeuon vagabundus* Gravenhorst.)

Hind tibiæ normal, *not* deeply incised at apex; the tarsi attached normally.

Metanotum with the lateral basal and median areas *not* confluent.

Spiracles small, round ....(125) *Bathymetis* Förster.

Spiracles long oval or ovate (males).

Last joint of tarsi as long as the third; scutellum spotted with yellow (see p. 27).................(113) *Pezoporus* Förster.

Last joint of tarsi shorter than the third; scutellum black (see p. 27)...............................(112) *Stibeutes* Förster.

Metanotum with the lateral basal and the median areas confluent.
Spiracles rather large, elliptic-oval ....(126) *Plectocryptus* Thomson.
Spiracles rather small, short oval or subrotund.
(127) *Microcryptus* Thomson.
(Type, *Cryptus erythrinus* Gravenhorst.)

10. Clypeus in male and female anteriorly distinctly bidentate, or with two, more or less distinct, nipples.................................... 11
Clypeus with the anterior margin simple or with a single tooth............ 13

11. Eyes bare, never distinctly hairy.. 12
Eyes distinctly hairy.
Antennæ tricolored, ringed with white; first and second flagellar joints of an equal length.............. ....(128) *Iselix* Förster.
Antennæ neither tricolored nor ringed with white; first flagellar joint shorter than the second.................(129) *Homelys* Förster.

12. Metanotum at base *not* completely areolated..........(130) *Polytribax* Förster.
Metanotum at base completely areolated.
Carina at apex of the middle lateral area sharply elevated; second segment much narrowed toward the base, scarcely half as wide as at apex, and finely striately rugulose its entire length.
(131) *Ernoctona* Förster.
Carina at apex of the middle lateral area *not* sharply elevated; second segment *not* much narrowed toward base, more than half as wide as at apex, and not striate its entire length.
(132) *Plesiognathus* Förster.
(Type, *Phygadeuon cephalotes* Gravenhorst.)

13. Clypeus with *one* tooth on its anterior margin.....(133) *Micromonodon* Förster.
Clypeus with the anterior margin simple or without a tooth.
Transverse median nervure in hind wings *not* broken, or broken *below* the middle 14
Transverse median nervure in hind wings broken *at* or *above* the middle.
Transverse median nervure in front wings originating before the basal nervure; base of third discoidal cell much wider than the base of the second discoidal cell..........(134) *Heterotypus* Förster.
Transverse median nervure in front wings *not* originating before the basal nervure; base of third discoidal cell not wider than the base of the second discoidal cell........(135) *Dapanus* Förster.
= *Sorbas* Förster = *Trichocryptus* Förster.
(Type, *Ichneumon cinctorius* Fabricius.)

14. Transverse median nervure in hind wing broken below the middle......... 15
Transverse median nervure in hind wings *not* broken.
Abdominal segments 2 and 3 very large.............(136) *Hedylus* Förster.

15. Pronotum not lengthened; ovipositor prominently projecting............... 16
Pronotum lengthened; ovipositor only slightly visible beyond the tip of the abdomen............................(137) *Dirophanes* Förster.

16. Petiolar area very short, the areola narrow, rectangular, extending to apex; head very small; antennæ slender, filiform.
(138) *Tricholinum* Förster.
Petiolar area not very short, the areola not long, rectangular, most frequently transverse and hexagonal, rarely pentagonal, if elongate, narrowed toward base, rarely wholly wanting.
Eyes bare.. 18
Eyes hairy.
Second abdominal segment shorter than the third................. 17

Second abdominal segment a little longer than the third, smooth and polished, the post petrole striate........(139) *Zaphleges* Förster.
(Type, *Phygadeuon leucostigimus* Gravenhorst.)

17. Fovea at base of scutellum divided by a sharp carina, metanotum completely areolated, the areola transverse, trapezoidal.
(140) *Endasys* Förster.

Fovea at base of scutellum *not* divided by a sharp carina; metanotum completely areolated, the areola longer than wide, hexagonal.
(141) *Baryntica* Förster.

18. Middle joints of flagellum above in female *not* flattened, in male clothed usually with short, shaggy hairs.............................. 19

Middle joints of flagellum above much flattened.

Metanotum exareolated or very incompletely areolated; spiracles *large*, linear or elliptical..................................(142) *Giraudia* Förster.
(Type, *Cryptus congruen* Gravenhorst.)

Metanotum with a long middle area, the areola and basal area very united; spiracles *not* large, oval; subdiscoidal nervure in hind wings originating very close to the origin of the transverse median area.................................(143) *Schenkia* Förster.
(Type, *Cryptus graminicola* Gravenhorst.)

19. Metathorax with four distinct prominent teeth; disco-cubital nervure broken by a stump of a vein near the middle.(144) *Rhembobius* Förster.
(Type, *Phygadeuon quadrispinosus* Gravenhorst.)

Metathorax at most with two prominent teeth, often unarmed.

Hind tibiæ normal... 20

Hind tibiæ toward apex broadened and broadly flatly truncate.
(145) *Colocnema* Förster.

20. Metanotum at base usually more or less incompletely areolated, the areola and basal areas confluent, or the former is not separated from the middle lateral areas by a sharp carina........................ 21

Metanotum at base completely areolated 24

21. Lower tooth of mandibles much longer than the upper tooth.

Head quadrate; transverse median nervure interstitial with the basal nervure................................(146) *Ecporthetor* Förster.
(Type, *Phygadeuon fortipes* Gravenhorst.)

Lower tooth of mandibles shorter or no longer than the upper tooth.

Metathoracic spiracles round, or very short oval, scarcely longer than wide.. 22

Metathoracic spiracles fully twice as long as wide, or nearly.

Areola seen from above pyramidal; metathoracic spiracles not quite twice as long as wide.................(147) *Neleophron* Förster.

Areola seen from above not pyramidal; metathoracic spiracles twice or more than twice longer than wide....(148) *Epiphobus* Förster.

22. Head cubiform.

Femora somewhat short and swollen; antennæ short, stout; metanotum without or with areas confluent.......(149) *Ecpaglus* Förster.
(Type, *Phygadeuon brevicornis* Gravenhorst.)

Head *not* cubiform.

Disco-cubital nervure *with* a short process......(150) *Odontoneura* Förster.

Disco-cubital nervure *without* a process.

Second recurrent nervure received by the areolet *at* or *behind* the middle.. 23

Second recurrent nervure received by the areolet *before* the middle.

Metanotum coarsely rugose, the areola very high and narrow; first abdominal segment wholly striate...(151) *Ulothymus* Förster.

Metanotum *not* coarsely rugose, the first and second lateral areas confluent; first abdominal segment *not* striate.
(152) *Ophidnus* Förster.

23. Lower tooth of mandibles very small and *much* shorter than the upper tooth.
(153) *Homotherus* Förster.

Lower tooth of mandibles equal, or nearly, with the upper tooth.
Posterior tibiæ and tarsi normal, not spinulose.
First three segments of abdomen finely coriaceous, the second a little longer than the third .... (154) *Pammachus* Förster.
=*Stenocryptus* Thomson.
First three segments of abdomen smooth, the second and third of an equal length.................. (155) *Phygadeuon* Gravenhorst.
Posterior tibiæ and tarsi spinulose.
Metathorax bidentate.................... (156) *Trachyphyrus* Haliday.

24. Spiracles of the second and third abdominal segments placed close to the lateral margin.. 25
Spiracles of the second and third abdominal segments placed away from the lateral margin.. 26

25. Scutellum very flat .... (157) *Terpiphora* Förster.
Scutellum convex .... (158) *Scinascopus* Förster.

26. Third abdominal segment *not* longer than the second...................... 27
Third abdominal segment longer than the second.... (159) *Medophron* Förster.

27. Metanotum with the areola most frequently hexagonal, never pentagonal, the basal area never triangular.................................. 28
Metanotum with the areola regularly pentagonal, quite pointed toward apex, the basal area triangular .... (160) *Phyzelus* Förster.

28. Anterior margin of clypeus *not* emarginate; metathoracic spiracles surrounded by sharp curved carinæ.................. (161) *Bachia* Förster.
Anterior margin of clypeus more or less emarginate.
Metanotal carina angular; radius originating from the middle of the stigma; first abdominal segment *with* strong dorsal carinæ.
(162) *Nunechés* Förster.
Metanotal carina curved; radius originating behind the middle of the stigma; first abdominal segment *without* dorsal carinæ; upper tooth of mandibles more than twice as long as the lower.
(163) *Demopheles* Förster.

Tribe III. HEMITELINI.

1868. *Hemiteloidæ*, Family 24, Förster, Verh. d. naturh. Ver. pr. Rheinl., XXV, pp. 144 and 173.
1873. *Hemitelina*, Tribus, Thomson, (part) Opus. Ent., V, p. 468.
1884. Opus Ent., X, p. 967.
1894. *Hemitelini*, Tribe II, Ashmead, Proc. Ent. Soc. Wash., III, p. 278.
1900. *Hemitelini*, Tribe III, Ashmead, Smith's Insects of New Jersey, p. 569.

Thomson (see above) included with this tribe Förster's *Pezomachoidæ*, but so far I have been able to separate the two readily by the characters made use of in my table of tribes, the female being distinguished by metathoracic characters and the winged males by the difference in the shape of the basal nervure in the front wings.

Förster gave no character to separate the winged males in this group from those in the *Pezomachini*, and I suspect he may have included some of them here under different generic names, since I have already recognized three or four generic types of males among the *Pezomachini*.

Some 78 genera fall in this tribe, as at present interpreted, although some of these, if I have identified them correctly, will have to be removed to other tribes later, that is, to the *Phygadeuonini Pezomachini*, and possibly to the *Plectiscini*.

TABLE OF GENERA.

First transverse cubitus *not* entirely wanting, usually very distinct, the areolet pentagonal in position, but open behind, the transverse nervure entirely wanting or very pale, subobsolete.................. 3

First transverse cubitus entirely wanting, the discocubital nervure being interstitial with the second abscissa of the radius, the areolet wholly wanting 2

2. First joint of flagellum as long or somewhat longer than the second; vertex as high as the upper eye margins.

Ocelli lying close to the eyes........................(164) *Spinolia* Förster.

Ocelli not lying close to the eyes, the lateral ocelli as wide, or nearly, from each other as to the eye margin.

Antennæ 20-jointed or more ....(165) *Allocota* Förster.

Antennæ short, less than 20-jointed..(166) *Alastoneura* Kriechbaumer.

First joint of flagellum shorter than the second; vertex much higher than the upper eye margins; ocelli far away from the eyes; eyes small; antennæ 17-jointed.....................(167) *Synechès* Förster.

3. Metanotum not at all areolated..........................(168) *Chirotica* Förster.

Metanotum more or less areolated.

Second discoidal cell closed.. 5

Second discoidal cell open at apex 4

4. Wings in female much shortened, without a stigma; head quadrate. (169) *Catolytus* Förster.

Wings normal, with a stigma; head transverse.

Antennæ 15–17-jointed; metathorax with the petiolar area very large. (170) *Gnypetomorpha* Förster.

Antennæ at least 19-jointed; metathorax regularly areolated. (171) *Xenolytus* Förster.

5. Metathoracic spiracles round 6

Metathoracic spiracles oval ....(172) *Otacustes* Förster.

6. Transverse median nervure in hind wings broken....................... 15

Transverse median nervure in hind wings not broken, straight.

Antennæ more than 17-jointed; second abscissa of the radius not 5 times as long as the first 7

Antennæ 17-jointed; marginal cell very long and pointed, the second abscissa of radius about 5 times as long as the first. (173) *Cænomeris* Förster.

7. Discoidal cell closed at apex.. 8

Discoidal cell open at apex.

Second discoidal cell closed.........................(174) *Acrolyta* Förster.

8. Hind femora very thick...........................(175) *Gunopaches* Förster.

Hind femora not very thick, normal.

Metanotum with the carina distinct, not obliterated at the middle 9

Metanotum with the carina obliterated at the middle.

Parapsidal furrows uniting at the middle of the mesonotum; areolet irregular; first abscissa of the radius fully half the length of the second; first joint of the flagellum longer than the second ....(176) *Thestis* Förster.

Parapsidal furrows not uniting at the middle of the mesonotum; areolet regularly formed: first abscissa of radius not half the length of the second; first joint of flagellum shorter than the second ....(177) *Pemon* Förster.

9. Metathorax with the petiolar area bounded by a prominent ridge above, the middle lateral area also prominent ......(178) *Trisacra* Förster.

Metathorax with the petiolar area not bounded by a prominent ridge above.

Metanotum incompletely areolated 14

Metanotum completely areolated.

Face not clothed with long glittering white hairs; mesonotum with the parapsidal furrows incomplete or wanting.............. 10

Face clothed with long glittering white hairs; mesonotum with the parapsidal furrows complete.

Face very much narrowed.........(179) *Ischnurgops* Förster.

Face broad...........................(180) *Steganops* Förster.

10. Middle lateral areas very strongly toothed..............(181) *Ischyracis* Föster.

Middle lateral areas not strongly toothed.

Clypeus distinctly separated; anal valves in male small; mandibles not emarginate at the middle.................................. 11

Clypeus not separated, wholly bent downward, the anterior margin squarely truncate; anal valves in male very large, prominent; mandibles very small, emarginate medially.
(182) *Astomaspis* Förster.

11. Petiolar area *not* confluent with the areola................................ 12

Petiolar area confluent with the areola and extending nearly to the base of the metanotum; antennæ 18-jointed, toward apex clavate.
(183) *Microplex* Förster.

12. First joint of flagellum fully as long or longer than the second.............. 13

First joint of flagellum a little shorter than the second....(184) *Lysibia* Förster.

13. Middle vein in hind wings toward the base obliterated and only visible by a hyaline line..........................(185) *Daëtora* Förster.

Middle vein in hind wings distinct, not obliterated at base.

Metanotum with 5 areas; spiracles of the first abdominal segment very prominent...........................(186) *Aclastus* Förster.

Metanotum with 3 areas; spiracles of the first abdominal segment not at all prominent.......................(187) *Opisthostenus* Förster.

14. Metanotum *without* areas at base; wings very narrow. (188) *Asthenoptera* Förster.

Metanotum *with* areas at base; wings broad ....(189) *Stygera* Förster.

15. Metathoracic ridge *not* interrupted at the middle........................... 16

Metathoracic ridge interrupted at the middle.

First abominal segment short, broad, and strong ..(190) *Diaglypta* Förster.

16. Eyes distinctly hairy.................................(191) *Habromma* Förster.

Eyes not hairy.

Ocelli touching the eyes ....(192) *Plesiomma* Förster.

Ocelli not touching the eyes.

Clypeus bare, or nearly, *without* long hairs 17

Clypeus with long hairs, almost forming a fascicle.
(193) *Bathythrix* Förster.

17. First joint of the flagellum somewhat shorter than the second 18

First joint of the flagellum as long as or longer than the second............ 19

18. Third joint of the flagellum as well as the second joint somewhat longer than the first; clypeus anteriorly at the middle impressed and broadly, although slightly, emarginate............(194) *Algina* Förster.

Third joint of the flagellum not longer than the first; clypeus anteriorly at the middle neither impressed nor emarginate. (195) *Daïctes* Förster.

19. Transverse median nervure in hind wings broken at or below the middle, never above the middle.. 20

Transverse median nervure in hind wings broken above the middle. (196) *Strepsimallus* Förster.

20. Head widened behind the eyes, the temples broad.....(197) *Ænoplex* Förster.

Head *not* widened behind the eyes, the temples flat or narrow.

Discoidal nervure not longer than the base of the discocubital cell..... 21

Discoidal nervure longer than the base of the discocubital cell. (198) *Mastrus* Förster.

21. Metanotum with the apical carina strongly angulated or toothed. (199) *Lymeon* Förster.

Metanotum with the apical carina normal.

Radius more or less curved, but not broken at a right angle............ 22

Radius broken almost at a right angle..........(200) *Paraphylax* Förster.

22. Discoidal cell not narrowed at base, the apex lying far from the hind margin of the wing... 23

Discoidal cell much narrowed at base, the apex not far from the hind margin of wings, the entire radius strongly arcuate; transverse median nervure in hind wings quite near the inner margin. (201) *Rhadiurgus* Förster.

23. Metanotum *without* carinæ..............................(202) *Aschistus* Förster.

Metanotum *with* carinæ.

Clypeus anteriorly *without* an impression 24

Clypeus anteriorly with an impression on both sides.

Metanotum coarsely rugose; antennæ in male thick, the first joint of the flagellum not thrice as long as thick.....(203) *Tolmerus* Förster.

Metanotum *not* coarsely rugose; antennæ slender, filiform, the first three joints of flagellum at least five times as long as thick. (204) *Rhadinocera* Förster.

24. Clypeus anteriorly *not* bidentate; middle lateral areas not broadly carinately prominent at apex 25

Clypeus anteriorly at the middle bidentate; middle lateral areas at apex broadly carinately prominent................(205) *Isadelphus* Förster.

25. Penultimate joint of the maxillary palpi more than half as long as the last.. 26

Penultimate joint of the maxillary palpi only half as long as the last. (206) *Blapsidotes* Förster.

26. Third joint of hind tarsi as long as or longer than the fifth 27

Third joint of hind tarsi shorter than the fifth.

Spiracles of the first abdominal segment placed somewhat before the middle; ovipositor with a slight upward curve. (207) *Allomacrus* Förster.

27. Third joint of hind tarsi longer than the fifth 29

Third joint of hind tarsi of an equal length with the fifth.

Clypeus distinctly but not deeply separated; all femora, and especially the hind pair, distinctly thickened; head much narrowed behind the eyes; the middle lateral areas at apex not strongly prominent.. 28

Clypeus very deeply separated; femora not especially thickened; head not especially narrowed back of eyes; metathorax with five areas at apex, the middle lateral area strongly prominent at apex. (208) *Philonygmus* Förster.

28. Metathorax at apex perpendicularly truncate, the carinæ not sharp, the petiolar and lateral apical areas confluent; first abdominal segment at apex twice as wide as at base; disco-cubital nervure broken by a stump of a vein; antennæ usually ringed with white. (209) *Barydotira* Förster.

Metathorax at apex not perpendicularly truncate, the carinæ very sharp, the petiolar area separated from the lateral apical areas; first abdominal segment at apex not much wider than at base; antennæ not ringed with white ...... (210) *Pantolispa* Förster.

29. Metathorax as seen from the side perpendicularly truncate, or almost...... 30

Metathorax as seen from the side *not* perpendicularly truncate.............. 31

30. Dorsal carinæ of the first abdominal segment sharp and distinct from the base to beyond the middle; first joint of the flagellum scarcely longer than the second, the latter distinctly longer than the third, the ten joints before the last in female wider than long; marginal cell not longer than the stigma.......(211) *Microtorus* Förster.

Dorsal carinæ of first abdominal segment extending to the middle, but feeble; flagellum filiform, the first three joints much lengthened, slender and often of an equal length; marginal cell longer than the stigma ....(212) *Orthizema* Förster.

31. Clypeus medially somewhat produced and deflected at the sides. (213) *Chriodes* Förster.

Clypeus not produced medially and not deflexed at the sides.

  Antennæ not strongly thickened behind the middle.................... 32

  Antennæ strongly thickened behind the middle and the acuminate. (214) *Agasthenes* Förster.

32. Head not much shortened, also not especially broad nor lenticular.......... 33

Head much shortened, very broad and almost lonticular.

  First abscissa of radius usually small, scarcely longer than the transverse cubital nervure, at the most one-eighth the length of the second abscissa..........................(215) *Xenobrachys* Förster.

  First abscissa of radius at least one-third the length of the second abscissa. (216) *Brachycephalus* Förster.

33. First abdominal segment not bent at the middle, also not elevated.......... 34

First abdominal segment bent at the middle and somewhat elevated. (217) *Naëtes* Förster.

34. Last joint of maxillary palpi not longer than the penultimate and shorter than the third............................(218) *Ilapinastes* Förster.

Last joint of maxillary palpi longer than the penultimate.

  Scutellum laterally margined only at base 35

  Scutellum laterally margined to the apex.

    Spiracles of the third abdominal segment placed far from the lateral margin ....(219) *Gnotus* Förster.

    Spiracles of the third abdominal segment placed quite near the lateral margin ....(220) *Itamus* Förster.

35. Metathorax with the areola toward the base, not regularly and sharply pointed, usually hexagonal or wanting, the basal area not triangular. 36

Metathorax with the areola toward the base very regularly and sharply pointed, pentagonal, the basal area triangular.

  Second and third abdominal segments sharply but finely aciculate. (221) *Eudelus* Förster.

  Second and third abdominal segments *not* transversely aciculate; wings fasciate ....(222) *Idemum* Förster.

36. Basal area and areola wanting ....(223) *Phatnacra* Förster.
Basal area and areola present, or at least the areola is present.
Last joint of the hind tarsi hardly one-third longer than the fourth 37
Last joint of the hind tarsi hardly one-fifth longer than the fourth; anterior margin of the clypeus not truncate.
Second abdominal segment *with* sharp well-defined thyridia.
(224) *Ethelurgus* Förster.
Second abdominal segment *without* thyridia..(225) *Zoophthorus* Förster.
37. Transverse median nervure in hind wings broken *below* the middle.......... 38
Transverse median nervure in hind wings broken at the middle.
(226) *Diatora* Förster.
38. First three abdominal segments transversely impressed..(227) *Encrates* Förster.
First three abdominal segments *not* transversely impressed.
Clypeus *not* separated, quite flat, anteriorly truncate or medially projecting and feebly margined....................(228) *Adiastola* Förster.
Clypeus more or less distinctly separated.
Metathorax *without* two regularly formed transverse carinæ........ 39
Metathorax *with* two transverse carinæ, but *without* a closed areola.
(229) *Isdromus* Förster.
39. Second abdominal segment *not* finely, longitudinally aciculate.............. 40
Second abdominal segment finely, longitudinally aciculate; metathorax bidentate, the areola in the male as long as the petiolar area.
(230) *Ocymorus* Förster.
40. Abscissa of the cubitus behind the transverse discoidal nervure so strongly ben upward that it extends parallel with the transverse cubitus.
(231) *Urithreptus* Förster.
Abscissa of the cubitus behind the transverse discoidal *not* parallel with the transverse cubitus.
Head behind not very much narrowed.................................. 41
Head behind very much narrowed............(232) *Hemiteles* Gravenhorst.
41. Metathorax with the spiracular area *with* a sharp carina within.
(233) *Eriplanus* Förster.
Metathorax with the spiracular area *without* a sharp carina within; first abdominal segment *without* a sharp carina extending from the spiracles to apex.
Clypeus with the anterior margin *not* impressed medially; abscissa of the cubitus lying behind the transverse discoidal nervure and extending parallel with the second abscissa of the radius; ocelli in male not close to the eyes..........(234) *Isochresta* Förster.
Clypeus with the anterior margin medially impressed; abscissa of the cubitus lying behind the transverse discoidal nervure but strongly convergent with the second abscissa of the radius; ocelli in male very close to the eyes.................(235) *Charitopes* Förster.

Tribe IV. PEZOMACHINI.

1868. *Pezomachoidæ*, Family 23, FÖRSTER, Verh. d. naturh. Ver. pr. Rheinl., XXV, pp. 144 and 173.
1873. *Hemitelina*, Tribus THOMSON (part), Opus. Ent., V. p. 468.
1900. *Pezomachini*, Tribe IV, ASHMEAD, Smith's Insects of New Jersey, p. 569.

This tribe is here restricted to species having a non-areolated metathorax, or at most with only a transverse apical carina. The subapterous females with an areolated metathorax are removed to the

Phygadeuonini, where, in fact, Förster had already placed some of them under different generic names, namely: *Stibeutes*, *Pezoporus*, *Phyrtus*, and *Chamæzelus*. *Aptesis* Förster, as originally defined, seems to have included some *if not most* of these forms. The name, therefore, may have to disappear entirely, since all of the species placed here by Förster that I have had for examination belong to other genera, in a different tribe.

Agrothereutes Förster also can not be retained in this tribe. It is removed to the tribe *Cryptini*.

In this group the females, so far as my own observations go, seem to be always wingless or subapterous, never fully winged, while the males are most frequently fully winged, although wingless males are not rare. Both in this country and in Europe the males have been frequently mistaken and described as species of *Hemiteles*, and at present many of them will be found in our catalogues under that genus.

The strongly inwardly curved basal nervure of the front wings, together with the broad triangular stigma, will, however, easily separate them from genuine *Hemitelini*.

TABLE OF GENERA.

Winged species (males) 5
Wingless or subapterous.
  Ovipositor elongate, usually longer than half the length of the first abdominal segment, the second segment normal 2
  Ovipositor much abbreviated, either scarcely exserted or so short that it does not attain half the length of the first abdominal segment.
    Second abdominal segment very large, occupying most of the surface of abdomen; metathorax abruptly, obliquely truncate behind, the truncature superiorly bounded by a sharp carina; petiole very long and slender, not widened at apex.... (236) *Thaumatotypus* Förster.
    Second abdominal segment normal; petiole widened at apex.
      Metathorax sloping from the base; first joint of the flagellum longer than the second .... (237) *Cremnodes* Förster.
      Metathorax not sloping from the base; first joint of the flagellum not longer than the second .... (238) *Apterophygus* Förster.
2. Scutellum wanting 4
   Scutellum present 3
3. Rudimentary wings usually extending to or beyond the base of the metathorax; first abdominal segment punctured, not longitudinally aciculate, or striate .... (239) *Aptesis* Förster.
   Rudimentary wings not extending to base of metathorax, often scale-like; first abdominal segment more or less longitudinally striate, longitudinally wrinkled, or opaque, coriaceous ... (240) *Theroscopus* Förster.
   Wings wanting; metathorax with the apical transverse carina present; abdomen with 6 dorsal segments, the second and third large, subequal, the first not longitudinally striate ...... (241) *Pezomachus* Gravenhorst.
4. Face of the usual length .... (241) *Pezomachus* Gravenhorst.
   Face much abbreviated .... (242) *Pezolochus* Förster.
5. Transverse median nervure in hind wings broken far below the middle.
   (240) *Theroscopus* Förster.

Metanotum more or less distinctly areolated, the surface irregularly nyclose. (241) *Pezomachus* Gravenhorst.

Metathorax exareolated, with only the apical transverse carina present, the surface coriaceous or granulate .....(241) *Pezomachus* Gravenhorst.

Transverse median nervure straight, not broken, the subdiscoidal nervure absent ....(243) *Hemimachus* Ratzeburg.

Tribe V. HEMIGASTERINI.

This group is proposed for two genera differing from any in the preceding tribes in having a narrow, lanceolate stigma. In this character it comes nearest to the two tribes which are to follow, the *Cryptini* and the *Mesostenini*, but it is at once separated from them by the areolet in the front wings being wholly absent.

The marginal cell is rather long, extending almost to the tip of the wing; the first transverse cubitus is short but distinct; the second recurrent nervure joins the cubitus beyond this vein; while the subdiscoidal nervure originates from above the middle of the discoidal nervure.

The two genera falling here may be separated as follows:

TABLE OF GENERA.

Hind wings with the transverse median nervure straight, not broken, the subdiscoidal nervure wanting 2

Hind wings with the transverse median nervure angularly broken; ovipositor short, less than half the length of the abdomen; metathorax areolated .... (244) *Hemigaster* Brullé.

2. Mesonotal furrows more or less distinct; metathorax incompletely areolated; ovipositor as long as or longer than the abdomen. (245) *Macrogaster* Brullé.

Tribe VI. CRYPTINI.

1868. *Cryptoidæ*, Family 26, Förster, Verh. d. naturh. Ver. pr. Rheinl., XXV, pp. 144 and 186.

1873. *Cryptina*, Tribus (part), Thomson, Opus. Ent., V, p. 468.

1894. *Cryptini*, Tribe IV, Ashmead, Proc. Ent. Soc. Wash., III, p. 278.

1900. *Cryptini*, Tribe V, Ashmead, Smith's Insects of New Jersey, p. 570.

To this tribe belong the genuine Cryptines distinguished by the narrow lanceolate stigma and the distinct, usually pentagonal, areolet of the front wings, although this sometimes appears quadrate from having the two transverse cubiti straight and parallel, or nearly.

In addition to the shape of the stigma, it is further distinguished from the other tribes previously defined, except the *Pezomachini*, by metathoracic characters. The metanotum, except sometimes with an areola, is exareolated, and is without distinct longitudinal carinæ, or at the most the pleural carinæ are alone present, the lateral longitudinal carinæ always absent, its disk being simple, without carinæ, or with one or two transverse carinæ.

TABLE OF GENERA.

Wings abbreviated 28

Wings fully developed 1

1. Transverse median nervure in hind wings broken distinctly below the middle, usually *far* below the middle 8

Transverse median nervure in hind wings broken *at*, *near*, or somewhat *above* the middle, rarely very slightly below the middle 2

2. Transverse median nervure in front wings originating either before or behind the basal nervure, never distinctly interstitial with it 6½

Transverse median nervure in front wings *interstitial* with the basal nervure.

Metathorax *not* short 3

Metathorax short 6

3. Metanotum exareolated, but with two transverse carinæ, the apical carina sometimes obsolete medially, the spiracles short, oval, or rounded 4

Metanotum usually with 6 more or less distinct areas above; clypeus with a slight median tooth anteriorly; disco-cubital nervure *not* broken by a stump of a vein; apex of seventh or eighth dorsal abdominal segment with a white spot; tarsi with the fourth joint cordate, the last very large, as long as the second or longer.

(246) *Aritranis* Förster[1]=*Hygrocryptus* Thomson.

4. Disco-cubital nervure broken by a stump of a vein.

Disco-cubital nervure *not* broken by a stump of a vein.

Abdomen mostly red, not spotted with white. (247) *Habrocryptus* Thomson.

Clypeus *without* a median tooth anteriorly but with a transverse furrow or impression; areolet large, the sides parallel 5

Clypeus *with* a median tooth or projection anteriorly, the labrum usually projecting as a ledge from beneath; pleural carinæ of metathorax wanting; dorsal abdominal segments 7–8 with a white spot.

(248) *Hoplocryptus* Thomson.

5. Antennæ normal; metathorax and sides of the thorax *not* striate; dorsal abdominal segments 7 and 8 spotted with white at apex.

(249) *Spilocryptus* Thomson (part.).

Antennæ abnormal, compressed or dilated toward apex; first joint of the flagellum *not* longer than the second; metathorax and the sides of the thorax striated; abdomen not spotted with white. (Mexico.) (Female.) (See p. 40) .... (250) *Joppoceras* Ashmead, new genus.

(Type, *Cryptus dubiosum* Cresson Ashmead, manuscript.)

6½. Metathorax usually short, sloping off from its base, or obliquely truncate, but with two transverse carinæ; abdominal petiole normal, more or less broadened and bent or elbowed at apex; clypeus anteriorly truncate or slightly arcuate, but *without* a median tooth; disco-cubital nervure most frequently broken by a stump of a vein; abdomen red or red with black at apex, without white spots; submedian cell a little shorter than the median, rarely equal; metathoracic spiracles elongate .... (251) *Trychosis* Förster.

Metathorax not short.

Petiole of abdomen elongate, slender, *not* or only slightly thicker at apex than at base, as seen from the side straight or nearly, at most gently curved, but never distinctly bent or elbowed 7

Petiole of abdomen in female thickened and bent or elbowed at apex, slenderer in male; disco-cubital nervure not broken; abdominal segments 7–8 with a white spot above; metathoracic spiracles small, oval, the pleural carinæ present.

(249) *Spilocryptus* Thomson (part.).

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[1] This genus should be removed to the Tribe *Phygadeuonini*.

7. Metathorax strongly striate, with two transverse carinæ, the spiracles elongate; wings black or dark fuscous, the areolet large, with parallel sides; antennæ in female broadened and compressed between the middle and apex (male) (see p. 39)..(250) *Joppoceras* Ashmead, new genus.
(Type, *Cryptus dubiosum* Cresson.)

Metathorax *not* striate, but with two transverse carinæ, the spiracles elongate; wings mostly hyaline, the areolet large pentagonal, the sides slightly convergent above; antennæ filiform.
(252) *Linoceras* Taschenberg = *Osprynchotus* Kriechbaumer *nec* Spinola.
(Type, *Cryptus macrobates* Gravenhorst.)

Metathorax rounded off posteriorly, with only *one* transverse carina—the basal carina, the spiracles large, elongate; wings black, brown, or fuscous, never hyaline, the areolet large pentagonal, with parallel sides.
(253) *Joppidium* Walsh.
(Type, *Joppidium raficeps* Walsh.)

8. Second joint of maxillary palpi normal, never much dilated; antennæ in female usually filiform, setaceous, or flagelliform........................ 9

Second joint of maxillary palpi abnormal, much dilated, or triangular; antennæ in female thickened medially, ringed with white in both sexes; metathorax coarsely rugose, the upper hind angles toothed or subdentate, the areola indicated but poorly defined, never distinct, the spiracles long-oval................................(254) *Megaplectes* Förster.

9. Petiole of abdomen *not* cylindrical throughout, but dilated and usually bent or elbowed at apical third, where it is always more than twice wider than at base, or even thrice as wide, except in some males..... 12

Petiole of abdomen slender, cylindrical, and nearly of a uniform thickness throughout, or at the most only a little thicker at apex than at base, never twice as wide; as seen from the side it is straight or nearly, or at most slightly bent but never elbowed.

Metathorax *with* the apical transverse carina present, the spiracles elongate; head rostriform, the malar space long...(255) *Osprynchotus* Spinola.

Metathorax *without* a transverse carina, or at most with only a basal transverse carina, smooth, punctate, or transversely striate, especially posteriorly, but sometimes with a smooth, semicircular or triangular shaped space at base, the spiracles long linear................. 10

10. Disco-cubital nervure arcuate, *not* broken by a stump of a vein, the areolet variable in size and shape.. 11

Disco-cubital nervure broken by a stump of a vein, the areolet rather small, narrowed above, the transverse medium nervure originating from beyond the basal nervure; head subquadrate, not rostriform, the malar space normal. (Africa.)
(256) *Zonocryptus* Ashmead, new genus.
(*Cryptus sphingis* Ashmead, manuscript.)

11. Metanotum *without* a basal transverse carina, not short.

Areolet small, triangular, the submedian cell *shorter* than the median; mesonotal furrows distinct, sharply defined, the middle lobe convexly elevated; metathorax transversely striate. (Africa.)
(257) *Metarhyssa* Ashmead, new genus.
(Type, *Metarhyssa bifasiata* Ashmead, manuscript.)

Areolet large, with the sides parallel, the submedian cell a little *longer* than the median; mesonatal furrows distinct for two-thirds the length of the mesonotum; metathorax smooth shining. (South America.)
(258) *Opisoxestus* Ashmead, new genus.
(*Opisoxestus ferrugineus* Ashmead, manuscript.)

Metanotum *with* a basal transverse carina, short, rounded behind, rugose.

Areolet large, the sides convergent somewhat above, the mesonotal furrows distinct ....(259) *Distantella* Saussure.

12. Metathorax *with* one or two transverse carinæ, but *without* a longitudinal sulcus 13

Metathorax *with* a longitudinal sulcus or furrow, but *without* transverse carinæ. (260) *Mansa* Tosquinet.

13. Disco-cubital nervure *not* broken by a stump of a vein; wholly without a trace of such a vein 19

Disco-cubital nervure distinctly broken by a stump of a vein, or at least with a trace of such a vein.

Anterior tarsi in female normal, or at most with only the fourth joint cordate or emarginate, never with joints 2–4 cordate or emarginate..... 14

Anterior tarsi in female with joints 2–4 short, cordate, emarginate or lobate, as well as sometimes joints in the other tarsi; cheeks, or the malar space, long; antennæ filiform or tapering off toward apex (males difficult to separate from *Cryptus*, the forehead above insertion of antennæ concave, the spiracles of metathorax larger and longer, the upper hind angles rarely dentate, while the apical transverse carina is wanting or subobsolete) ....(261) *Meringopus* Förster.

14. Clypeus anteriorly armed with a median tooth or projection, or angulated.. 18

Clypeus anteriorly normal, unarmed, either truncate or rounded.

Metathorax with *two* distinct transverse carinæ, or at most with the apical carina vaguely or indistinctly defined only medially 15

Metathorax with only *one* complete transverse carina, or smooth *without* any 17

15. Metathorax short, obliquely truncate posteriorly, the spiracles oval or elliptical 16

Metathorax not short, with the upper hind angles often toothed or with the apical transverse carina strongly elevated laterally, the spiracles elongate, or small, short oval, or rounded.

Metathoracic spiracles large, elongate or linear, the metapleural carina indistinct or obliterated posteriorly from the basal transverse carina; median and submedian cells equal, or the latter is a little the shorter; areolet large, the sides convergent above; head transverse, narrowed behind; antennæ filiform, in females most frequently ringed with white; abdominal segments 1–4 not wholly smooth, punctate or coriaceous, the spiracles of the second placed at or before the middle.

Areola of metathorax *not* defined; first joint of flagellum elongate, longer than the second.........................(262) *Cryptus* Fabricius. (Type, *Cryptus spinosus* Fabricius.)

Areola of metathorax more or less defined by surrounding carinæ. (263) *Itamoplex* Förster.

Metathoracic spiracles small rounded or short oval, the metapleural carina distinct; areolet in front wings moderately large, with the sides convergent above; stump of vein on the disco-cubital nervure very minute or almost obliterated.

Submedian cell a little shorter than the median; metathorax with the super hind angles dentate, the spiracles small, short, oval; body marked with red, black, and white, abdomen usually with some white bands...........(264) *Chromocryptus* Ashmead, new genus. (Type, *Chromocryptus albopictus* Ashmead, manuscript.)

Submedian and median cells equal; metathorax with the upper hind angles simple, *not* dentate, the spiracles small, round; thorax mostly black, marked with yellow or white, abdomen mostly red, not banded with white (see p. 39). (247) *Habrocryptus* Thomson (part).

16. Submedian cell a little shorter than the median or equal to it; areolet large, with parallel sides; head transverse, not thick antero-posteriorly, the temples narrower than the width of the eyes; antennæ filiform, the first three joints of the flagellum not especially elongate, the first in female a little longer than the second, in male about equal with the second; abdominal segments 1–4 wholly smooth, neither punctate nor coriaceous, the spiracles of the second placed behind the middle; ovipositor short.
(265) *Idiolispa* Förster = *Liocryptus* Thomson.

17. Metathorax finely closely punctate or shagreened, the pleural carinæ distinct, the spiracles small, round; areolet moderately large, the sides convergent above; head transverse, the temples not well developed; antennæ slender, filiform, the first three or four joints of the flagellum elongate, the first in female longer than the second (see p. 39).
(247) *Habrocryptus* Thomson (part).

18. Metathorax with *two* transverse carinæ, the spiracles small, rounded, the pleural carina wanting or vaguely defined posteriorly; median and submedian cells equal or sometimes with the median cell a little the shorter; areolet with the sides convergent above; head quadrate or subquadrate, the temples full, broad; antennæ filiform, ringed with white, the first joint of the flagellum a little longer than the second ....(266) *Kaltenbachia* Förster.

Metathorax with only *one* complete transverse carina—the basal, the apical transverse carina indicated only laterally, or the upper hind angles are toothed.

The metathoracic pleural carina complete, the spiracles oval or oblong; areolet with sides convergent above; submedian cell slightly shorter than the median; head subquadrate; antennæ not ringed with white ....(267) *Cryptoideus* Ashmead, new genus.
(Type, *Cryptus purpuripennis* Cresson.)

The metathoracic pleural carina wholly absent, the upper hind angles spined, the spiracles long, elliptic; areolet large, the sides almost parallel; submedian and median cells equal; head transverse, the temples flat................(268) *Cryptopteryx* Ashmead, new genus.
(Type, *Cryptopteryx columbianus* Ashmead, manuscript.)

19. Marginal cell rather short, the areolet large or moderate, the sides parallel or nearly, rarely small, with the sides convergent above; metathoracic spiracles small, round, short-oval, oval or ovate, *never* elongate or linear; abdomen most red, black at apex, and usually spotted with white, very rarely wholly red................................ 21

Marginal cell elongate, the areolet with the sides usually convergent above, rarely parallel; metathoracic spiracles large, elongate, or linear, never round or short oval; abdomen not spotted with white at apex.

Metathorax *with* one or two distinct transverse carinæ (sometimes wanting in males), the pleural carina more or less distinct, the upper hind angles sometimes dentate................................ 20

Metathorax *without* transverse carinæ, or at the most with the basal alone vaguely and indistinctly defined laterally, the pleural carina absent, the spiracles very large, linear; head subquadrate, the temples rather broad; clypeus anteriorly truncate, the labrum visible from beneath as a semicircular ledge; first three joints of the flagellum not long, not or scarcely thrice as long as thick, the first in the female not longer than the second; parapsidal furrows vaguely defined *far* anteriorly only; wings fuscous, maculate, or banded.

(269) *Compsocryptus* Ashmead, new genus.
(Type, *Cryptus calipterus* Say.)

20. Head transverse, narrowed behind the eyes, rarely subquadrate, the malar space long; clypeus anteriorly truncate, the labrum projecting from beneath as a semicircular ledge and transversely impressed; wings usually marked with red or yellow, rarely concolorous, the median and submedian cells equal or nearly, the areolet rather large; metathorax with two transverse carinæ, the upper hind angles toothed; abdomen coriaceous or punctate, the spiracles of the second placed a little behind the middle, those of the third much before the middle; fourth joint of tarsi strongly emarginate or bilobed.

(270) *Callicryptus* Ashmead, new genus.
(Type, *Cryptus fasciatus* Brullé.)

21. Clypeus normal, the anterior margin *without* a median tooth................ 22

Clypeus impressed on each side of the anterior margin and with a median tooth.

(271) *Cænocryptus* Thomson.

22. Head transverse, narrowed behind or not nearly quadrate or cubical, the temples never as wide as the eyes.............................. 23

Head cubical or subquadrate, the temples broad, full, as wide or a little wider than the eyes.

Flagellum in female usually ringed with white, the first joint *not* or only a little longer than the second; metathorax long, with only the apical transverse carina present, the spiracles oval or rounded; ovipositor most frequently longer than the abdomen.

(272) *Chæretymma* Förster = *Cratocryptus* Thomson.

23. First joint of the flagellum distinctly longer than the second................ 24

First joint of the flagellum not longer than the second, usually a little shorter.

Metathorax rather long, the basal transverse carina usually well defined but sinuate, the apical transverse carina being entirely obliterated medially; spiracles oval; areolet large, pentagonal, the sides very nearly parallel, receiving the second recurrent nervure beyond its middle; median and submedian cells equal or the latter slightly the longer; tarsal joints strongly spinous at apex.

(273) *Pycnocryptus* Thomson.

24. Front wings with the lower angle of the discoidal cell somewhat obtuse, the areolet most frequently large, with the sides parallel or nearly, rarely convergent above.................................... 26

Front wings with the lower angle of the discoidal cell posteriorly straight, the areolet small, the sides convergent above.

Submedian vein in the hind wings *not* abruptly broken at the transverse median nervure but continued far beyond.................... 25

Submedian vein in the hind wings abruptly broken at the transverse median nervure.

Face narrowed, the cheeks short; parapsidal furrows short but distinct.

(274) *Hidryta* Förster = *Brachycryptus* Thomson.

25. Metathoracic spiracles small, round, or very short oval; last joint of the hind tarsi distinctly shorter than the third or at least no longer.

(275) *Gambrus* Förster.

26. Areolet with the sides distinctly convergent above........................ 27

Areolet with the sides parallel or nearly *not* or scarcely convergent above; malar space distinct; metathorax with the apical transverse carina some-

times obliterated at the middle, the spiracles short-oval or rounded; tip of abdomen black, with one or more white spots above.
(276) *Agrothereutes* Förster=*Spilocryptus* Thomson (part).

27. Metathorax not short; areolet large; tip of abdomen black, usually with one or two white spots above.
(276) *Agrothereutes* Förster=*Spilocryptus* Thomson.

28. Metathorax with only the first transverse carina present, the second represented by sharp ridges at the upper hind angles, the spiracles small, rounded; first joint of flagellum elongate; apex of abdomen with a white spot above ....(276) *Agrothereutes* Förster.

Tribe VII. MESOSTENINI.

1900. *Mesostenini*, Tribe VI, ASHMEAD, Smith's Insects of New Jersey, p. 570.

This tribe is proposed for several genera heretofore placed with the *Cryptini* and which are closely allied to them. On the other hand, they present a general *habitus* peculiarly their own, difficult to express in words, but easily recognized by the experienced eye, and which seems to me to justify their separation as a distinct minor group.

For the present, however, the only character I can give to separate them is the one used in my table of tribes, namely, the small quadrate areolet, which is sometimes nearly punctiform and often open behind, but which is never pentagonal in position, or large quadrate, as in the *Cryptini*. The legs, too, relatively speaking, are, as a rule, longer and slenderer, and increase more rapidly in length, antero-posteriorly, than in the others.

Ten genera have been recognized in the group, separable as follows:

TABLE OF GENERA.

Head *with* one or two spines or carinæ between the antennæ.................. 7

Head *without* a spine or carina between the antennæ.

Claws large; last joint of hind tarsi about the length of the third; basal joint of front tarsi much shorter than the tibiæ; ovipositor shorter than the body 2

Claws small; last joint of hind tarsi much shorter than the third; basal joint of front tarsi as long, or nearly, as the tibiæ; ovipositor usually longer than the body, or at least never shorter than the abdomen.
(277) *Nematopodius* Gravenhorst.

2. Thorax *not*, or only a little, more than twice as long as wide.............. 6

Thorax three or more times longer than wide.

Mesonotum *without* parapsidal furrows, or at most only feebly or vaguely defined anteriorly.

Mesonotum *with* the parapsidal furrows distinct for at least two-thirds its length; first joint of flagellum longer than the second............... 3

3. Metathorax with the upper hind angles tuberculate, dentate, or spined, the basal transverse carina alone present, distinct, the apical wanting or incomplete.. 4

Metathorax with the upper hind angles rounded, unarmed; both transverse carinæ usually present, entire, although the apical transverse carina is sometimes obliterated medially, but always distinct or highly elevated laterally..........(278) *Mesostenus* Gravenhorst =*Stenaræus* Thomson.

4. Petiole of abdomen longer and slenderer, only slightly and gradually widened toward apex, *not* elbowed, the spiracles closer to each other than to the apex; areolet usually somewhat larger, quadrate 5

Petiole of abdomen shorter, bent or elbowed and much widened at apical third, the spiracles usually wider from each other that to the apex; areolet smaller.

Head a little wider than the thorax; areolet closed.

(279) *Mesostenoideus* Ashmead, new genus.

(Type, *Mesostenus albomaculatus* Cresson.)

Head scarcely so wide as the thorax, or no wider; areolet open behind.

(280) *Christolia* Brullé.

5. Metapleural carinæ distinct to the base of the hind coxæ; transverse median nervure in hind wings obtusely angularly broken by the subdiscoidal nervure near its basal third; scutellum margined at sides only anteriorly..(281) *Cryptanura* Brullé

Metapleural carinæ wholly wanting or at least not extending beyond the first transverse carina; transverse median nervure in hind wings straight, the subdiscoidal nervure originating from its basal fourth.

(282) *Brachycoryphus* Kriechbaumer.

6. Metathorax short, with only one transverse carina—the basal; hind legs much longer than the middle and anterior pairs; areolet open behind.

(283) *Crypturopsis* Ashmead, new genus=*Crypturus* Ashmead *nec* Gravenhorst.

(Type, *Crypturus texanus* Ashmead.)

7. Head with only *one* spine or acute carina between the antennæ; mesonotum trilobed.

Metathorax with the apical transverse carina wanting or subobsolete, the upper hind angles prominently toothed or spined; abdomen *without* thyridia between segments 2 and 3...........(284) *Polycyrtus* Spinola.

Metathorax with the apical transverse carina distinct, prominent, the upper hind angles at most subdentate; abdomen *with* thyridia between segments 2 and 3.........................(285) *Listrognathus* Tischbein.

Head with *two* spines or acute carinæ between the antennæ; mesonotum not trilobed.......................................(286) *Polyænus* Cresson.

Subfamily III. PIMPLINÆ.

1859. *Pimplariæ* HOLMGREN, Öfvers. Vet.-Akad. Förh., XVI, pp. 121–132.
1887. *Pimplinæ*, Subfamily, CRESSON, Syn. Hym. North America, p. 49.
1888. *Pimplariæ* THOMSON, Opus. Ent., XII, p. 1247.
1895. *Pimplinæ*, Subfamily VI, ASHMEAD, Proc. Ent. Soc. Wash., III, p. 278.
1900. *Pimplinæ*, Subfamily III, ASHMEAD, Smith's Insects of New Jersey, p. 571.

The species falling in this subfamily are readily distinguished from those previously treated of by the characters made use of in my table of subfamilies—the shape of the abdomen, the shape of the first segment of the abdomen and the position of its spiracles, and the venation of the front wings.

The abdomen is elongate, subcylindrical or depressed, rarely subcompressed at apex, most frequently sessile, more rarely petiolate and always with a prominent ovipositor; the first segment is straight, rarely bent or curved, as in the *Ichneumoninæ* and the *Cryptinæ*, and with the spiracles, except in two or three cases, placed *at* or *before* the middle; while the areolet in the front wings, when present, is most frequently small, triangular, oblique, or rhomboidal, often petiolate, but very rarely pentagonal.

Five minor groups, or tribes, have been recognized; one being based upon Cresson's genus *Labena* and its allies, and the others upon four of Förster's so-called families—*Acœnitoidæ*, *Lissonotoidæ*, *Pimploidæ*, and *Xoridoidæ*.

These tribes may be recognized by the use of the following table:

TABLE OF TRIBES.

Head transverse, rarely subquadrate, and usually narrowed or rounded off behind, the temples not broad; mandibles always fitting close to the clypeus, *not* forming a kind of mouth opening.
  Abdomen somewhat compressed toward apex, the ventral valve prominent, plowshare-shaped, or sometimes very large lanceolate; if the ventral valve is hidden, the hind coxæ are abnormally long; antennæ usually rather short and straight; hind legs much lengthened and usually with stout femora.
    Hypopygium prominent, plowshare-shaped or lanceolate; hind coxæ normal, rarely three times as long as thick............Tribe I. ACŒNITINI.
    Hypopygium *not* prominent, hidden; hind coxæ abnormally long, four or more times longer than thick....................Tribe II. LABENINI.
  Abdomen depressed, rarely weakly compressed toward apex, the ventral valve never prominent or plowshare-shaped; antennæ longer and sometimes eroded; hind coxæ never abnormally lengthened.
    Abdomen smooth, *without* impressions and never strongly punctured, at the most alutaceous or shagreened; no lateral impressed lines on segments 2–5......................................Tribe III. LISSONOTINI.
    Abdomen with more or less distinct impressions and usually also strongly punctured; if smooth, alutaceous or coriaceous; always with lateral impressed lines on segments 2–5.................Tribe IV. PIMPLINI.
Head quadrate or cubical, the temples broad, not narrowed behind; mandibles most frequently slightly projecting forward and forming, with the clypeus, a a kind of mouth opening, or the clypeus is depressed.
Tribe V. XORIDINI.

Tribe I. ACŒNITINI.

1868. *Acœnitoidæ*, Family 17, FÖRSTER, Verh. d. naturh. Ver. pr. Rheinl., XXV, pp. 142 and 167.
1894. *Acœnitini*, Tribe I, ASHMEAD, Proc. Ent. Soc. Wash., III, p. 278.
1900. *Acœnitini*, Tribe I, ASHMEAD, Smith's Insects of New Jersey, p. 571.

This group is distinguished from all the others by the shape of the abdomen, which is much elongated, compressed at apex, and furnished with a large, prominent, plowshare shaped, or lanceolate, hypopygium; the antennæ are rather short and straight, while the hind legs are unusually long, with rather short and stout femora.

Superficially, many of the species falling in this group, especially among the males, resemble those in the tribe *Mesostenini*, in the subfamily *Cryptinæ*, in colorational pattern and in having long hind legs, but the shape of the abdomen and the venation of the front wings can always be depended upon to distinguish them.

Sixteen genera have been recognized separable as follows:

TABLE OF GENERA.

Front wings *without* an areolet.......... 6

Front wings *with* an areolet.

Areolet small, not rhomboidal; ovipositor shorter than the abdomen; if as long, then the hypopygium unusually large.......... 2

Areolet large, rhomboidal; ovipositor as long as or longer than the abdomen; head as in *exetartes*, but readily distinguished by the longer ovipositor.......... (287) *Leptobates* Gravenhorst.

2. Abdomen sessile, *not* long petioliform.......... 3

Abdomen petiolate, or the first segment long, slender, petioliform.

Areolet small, petiolet; abdomen elongate, narrowed toward base; claws pectinate.......... (288) *Leptobatopsis* Ashmead, new genus.

(Type, *Leptobatopsis australiensis* Ashmead, manuscript.)

3. Ovipositor *not* longer than the abdomen, or if longer the hind legs are very thick; antennæ short and straight.......... 4

Ovipositor longer than the abdomen, the hypopygium unusually large, lanceolate; mesonotum trilobed; metanotum not areolated with from two to four longitudinal carinæ, the spiracles rather large, oval.

(289) *Coleocentrus* Gravenhorst.

4. Disco-cubital nervure *without* a stump of a vein; hypopygium in female large, projecting beyond the tip of the abdomen.......... 5

Disco-cubital nervure *with* a stump of a vein or branch; hypopygium in female short; metanotum *without* carinæ; ovipositor longer than the abdomen.......... (290) *Procinetus* Förster.

5. Transverse median nervure in hind wings broken at the middle; metathorax laterally coarsely rugose, the middle space punctured but shining, the spiracles large, oval; ovipositor longer than the abdomen.

(291) *Mesoclistus* Förster.

Transverse median nervure in hind wings broken far below the middle; metathorax short, truncate posteriorly, and completely areolated, the spiracles small, round; scutellum and postscutellum laterally sharply margined; ovipositor somewhat shorter than the abdomen.

(292) *Aphanoroptrum* Förster.

6. Second joint of tarsi longer than the four following joints united.......... 7

Second joint of tarsi *not* longer than the four following joints united.......... 8

7. Second recurrent nervure uniting with the discoidal nervure before the very short transverse cubital-transverse median nervure in hind wings broken above the middle; first abdominal segment narrow, almost three times as long as wide.......... (293) *Crypturus* Gravenhorst.

Second recurrent nervure uniting *behind* the transverse cubitus; abdomen a little longer than the head and thorax united, the petiole elongate.

(294) *Encardia* Tosquinet.

8. Second recurrent nervure uniting *behind* the transverse cubitus.......... 9

Second recurrent nervure uniting *before* the transverse cubitus.

Anterior and middle claws cleft before the middle, the hind claws simple, the middle and hind tibiæ with 2 apical spurs; transverse median nervure in hind wings broken at or a little above the middle; hind legs much lengthened; ovipositor as long as the body.

(295) *Arotes* Gravenhorst.

9. Mesonotum *without* deep parapsidal furrows 11

Mesonotum *with* deep parapsidal furrows.

Disco-cubital nervure *with* a stump of a vein 10

Disco-cubital nervure *without* a stump of a vein.
(296) *Phænolobus* Förster.

10. Second abdominal segment longer than wide at apex, the hypopygium in female small and placed far away from tip of abdomen; coxæ much lengthened; ovipositor somewhat prominent .....(297) *Collyria* Schiödte.

Second abdominal segment not longer than wide at apex; hypopygium in female very large and projecting beyond tip of abdomen.
(298) *Chorischizus* Förster.

11. Metathorax elongate, quadrate, rugose, with a vaguely defined areola; head large, much longer than wide, slightly narrowed back of the eyes, the malar space long .... (299) *Hieroceryx* Tosquinet.

Metathorax and head quite differently shaped.

Metanotum *with* a well-defined transverse carina; hind femora much thickened; recurrent nervures very close.

Femora *not* compressed, the tibiæ normal; claws of four anterior feet with a blunt tooth before tip ....(300) *Acœnites* Latreille.

Femora compressed, the tibiæ bent, narrowed at base, the tarsi long, the posterior dilated, the last joint not incrassated, claws simple.
(301) *Acronus* Tosquinet.

Metanotum *without* a transverse carina; hind femora not especially thickened; recurrent nervures widely separated.
(302) *Asthenomeris* Förster.

Tribe II. LABENINI.

1900. *Labenini*, Tribe II, ASHMEAD, Smith's Insects of New Jersey, p. 571.

This group is proposed for three genera found only in the American fauna. In the shape of the abdomen it bears a superficial resemblance to some of the *Acœnitini*, but the hypopygium is hidden, neither prominent, plowshare shaped nor lanceolate, while from them and the other tribes it is readily separated by the abnormally long hind coxæ, which are four or more times longer than thick.

The characters made use of in the following table may be depended upon to distinguish the genera:

TABLE OF GENERA.

Cheeks armed with a strong tooth behind 2

Cheeks normal, unarmed.

Face rugoso-punctate; metathorax completely areolated; areolet in front wings large, pentagonal, the third discoidal cell shorter than the second; transverse median nervure in the hind wings broken slightly *above* the middle; first abdominal segment not especially long, very gradually widened toward apex, the spiracles placed before the middle ....(303) *Labena* Cresson.

Face finely coriaceous; metathorax long, exareolated, but with a transverse carina before the apex; areolet pentagonal, the third discoidal cell much longer than the second; transverse median nervure in hind wings broken *below* the middle; first abdominal segment very long, the spiracles placed a little behind the middle ....(304) *Nonnus* Cresson.

2. Face smooth impunctate; metathorax areolate at base only, the areola wanting;

areolet large, pentagonal, the third discoidal cell longer than the second; transverse median nervure in hind wings broken at the middle; first abdominal segment very long and slender, not at all or only slightly widened at apex, the spiracles at or very near the middle......(305) *Grotea* Cresson.

Tribe III. LISSONOTINI.

1868. *Lissonotoidæ*, Family 16, FÖRSTER, Verh. d. naturh. Ver. pr. Rheinl., XXV, pp. 142 and 166.
1894. *Lissonotini*, Tribe II, ASHMEAD, Proc. Ent. Soc. Wash., III, p. 278.
1900. *Lissonotini*, Tribe III, ASHMEAD, Smith's Insects of New Jersey, p. 371.

This tribe is distinguished from the two aforementioned by the shape of the abdomen, which is depressed, *not* compressed at apex, and *without* a prominent hypopygium; by the longer antennæ; and by coxal and venational characters.

It approaches nearest to the tribe *Pimplini*, but in that tribe the abdomen, although sometimes smooth, is usually strongly punctured, and has always more or less distinct transverse or oblique impressions, or *lateral impressed lines on segments 2–5*. In the *Lissonotini*, on the contrary, the abdomen is smooth, or at the most alutaceous or shagreened, but never strongly punctate, always *without* transverse or oblique impressions, and *never with lateral impressed lines on segments 2–5*.

The 31 genera falling in this group may be separated as follows:

TABLE OF GENERA.

Metathorax *not* areolated, at the most with a transverse apical carina, or with two median longitudinal carinæ 3
Metathorax more or less indistinctly areolated.
  Front wings *with* an areolet 2
  Front wings *without* an areolet.
    Abdomen sessile, with the first three segments rugulose, the ovipositor short; clypeus large, swollen at base; flagellar joints of male antennæ normal, not eroded; eyes hairy.
      (306) *Hybophanes* Förster=*Œdemopsis* Tschek.
2. Areolet oblique, elongate, subtrapezoidal...(307) *Pseudacœnites* Kriechbaumer.
3. Abdomen sessile, never petiolate 4
  Abdomen petiolate, head transverse; metathorax exareolate, *without* a transverse apical carina.
    Abdomen elongate, subfusiform, as seen from the side toward apex, clavate; marginal cell in front wings large, oblong; the areolet small, subtriangular and subpetiolate; legs elongate, slender.
      (308) *Atropha* Kriechbaumer.
    Abdomen toward base flat, rugose, the first segment flask-shaped, distinctly and longly petiolate; marginal cell in front wings not large, the areolet longly petiolate, the outer nervure faint or subobsolete; legs normal; antennæ not tapering toward apex, the last joint nearly as long as the three preceding joints united; ovipositor nearly as long as the abdomen.
      (309) *Taschenbergia* Schmiedeknecht.

4. Areolet always present, rarely incomplete, that is, open behind............ 6
Areolet wholly wanting.
Metanotum *with* two distinct longitudinal carinæ in both sexes........ 5
Metanotum *without* longitudinal carinæ. Claws closely, longly pectinate; mandibles bidentate..................(310) *Asphragis* Förster.

5. Clypeus normal; abdomen rather smooth, the first segment flat, longer than wide; ovipositor almost as long as the body; claws simple, not toothed; eyes bare; third joint of the flagellum at tip and the fourth joint at base in male eroded.
(311) *Lampronota* Haliday=*Cylloceria* Schiödte.

6. Body *not* especially hairy.. 7
Body, and especially the head, covered with shaggy gray or black hairs.
Metathorax coarsely punctured; eyes widely separated; abdomen in female somewhat compressed at apex, the first segment somewhat longer than wide, rugulose, the following smooth; claws simple, the onychia very small..................(312) *Arenetra* Holmgren.

7. Metathorax *with* a distinct transverse apical carina, or at least distinct laterally.. 11
Metathorax *without* a transverse apical carina.
Claws simple, neither toothed nor pectinate.......................... 9
Claws thickly and usually longly pectinate, never simple.............. 8

8. Antennæ long and slender, the last joint twice as long, or nearly, as the preceding; abdomen smooth, the first segment *without* carinæ, the spiracles of the second placed close to the lateral margin.
Transverse median nervure in hind wings broken very far *below* the middle; eyes not quite extending to the base of the mandibles, the malar space being fully as long as the pedicel, the latter being obliquely truncate from beneath; submedian and median cells in front wings equal..........................(313) *Phytodietus* Gravenhorst.
Transverse median nervure in hind wings broken *at* or a little *above* the middle; eyes extending to base of mandibles *without* a malar space; submedian cell in front wings distinctly shorter than the median. (New Zealand.) ....(314) *Euctenopus* Ashmead, new genus.
(Type, *Euctenopus zealandicus* Ashmead, manuscript.

9. Metapleural carinæ present, strong and long............................ 10
Metapleural carinæ wanting.
Abdomen subpetiolate, smooth, shining, and gradually narrowed toward base; antennæ long and slender, tapering toward apex, the terminal joint in male shorter than the penultimate; submedian cell *not* longer than the median..................(315) *Aphanodon* Förster.
Abdomen distinctly sessile, the first segment aciculate, segments 2–5 quadrate, the following wider than long, all finely punctate at base, but smooth and shining at apex; antennæ elongate, slender, setiform, but shorter than the body ....(316) *Nadia* Tosquinet.

10. Abdomen sessile, depressed, finely coriaceous; areolet in front wings pentagonal, the submedian cell longer than the median, the disco-cubital nervure *not* broken by a stump of a vein. Male.
(317) *Trevoria* Ashmead,[1] new genus.
(Type, *Trevoria yukatatensis* Ashmead, manuscript.)

11. Claws simple, *not* pectinate.. 21
Claws pectinate.
Claws shorter, not thickly pectinate, usually briefly pectinate toward base.. 12
Claws long, strong, and usually but not always thickly pectinate....... 17

12. Flagellum entirely composed of cylindrical, closely united, almost inseparable joints; ovipositor long.................................. 13

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[1] In honor of Prof. Trevor Kincaid.

Flagellum with the joints composing the apical half distinctly separable; ovipositor at the most as long as the abdomen.

Last half of the flagellum in the female with knob-like joints, appearing quite different from the basal half; the knob-like apical joints are as wide as long, almost rhomboidal, seen from beneath angulate, the last joint narrower and scarcely as long as the preceding. (318) *Xenacis* Förster.

The apical third only of the flagellum with distinctly separable joints; the terminal joints are also *not* knob-like, but only faintly compressed, above and beneath rounded, the last joint wider and as long as the two preceding joints united; abdomen perceptibly narrowed toward base, subpetiolate.................(319) *Cryptopimpla* Taschenberg.

13. Frons *without* horns.. 14

Frons with two horns.

Areolet longly petiolate; hind wings with the transverse median nervure broken below the middle; mesonotum without trace of furrows; scutellum laterally *not* margined; metapleural carina distinct posteriorly, the spiracles long, linear; abdomen with the first segment laterally toward base with two strong carinæ, the spiracles placed before the middle and distinctly visible from above ...(320) *Diceratops* Förster.

14. Clypeus *not* impressed; areolet usually petiolate 15

Clypeus at base posteriorly strongly impressed, the impression so covered with long hairs as to form a tuft; metanotum in female with a weak, transverse apical carina, stronger in male; metapleural carina faint, nearly obliterated; areolet sessile, irregularly pentagonal; spiracles of second abdominal segment placed close to the base; claws simple ....(321) *Ensimus* Förster.

15. Metapleura *not* separated from the metanotum by a carina, the spiracles large, elongate or linear; areolet longly petiolate; transverse median nervure in hind wings broken below the middle; face more or less swollen; mesonotum without trace of furrows; scutellum laterally margined only at base; first abdominal segment smooth, the spiracles placed before the middle; claws with abbreviated teeth and long bristles...........................(322) *Zyzeuctus* Förster.

Metapleura separated from the metanotum by a carina, the spiracles round or short oval 16

16. Claws distinctly but not closely pectinate.........(323) *Lissonota* Gravenhorst.

17. Areolet petiolate, rarely sessile; disco-cubital nervure angulate or angularly broken and usually with a stump of a vein 18

Areolet sessile; disco-cubital nervure bowed or strongly curved, never angulate and *without* a stump of a vein.

Claws shortly pectinate; transverse median nervure in hind wings broken *below* the middle......(324) *Meniscus* Schiödte=*Amersibia* Förster.

18. Metathorax normal *without* longitudinal carinæ........................ 19

Metathorax *with* 6 longitudinal carinæ............(325) *Phidias* Vollenhoven.

19. Frons above the antennæ normal, *not* at all impressed and *without* peculiar foveæ; metapleural carinæ wanting or only faintly indicated at base... 20

Frons above the antennæ impressed or concave, with the margins swollen on each side; metapleural carinæ distinct; transverse median nervure in the hind wings angularly broken below the middle; claws stout, pectinate, but not thickly; first abdominal segment with two carinæ at the basal third..(326) *Bathycetes* Förster=*Bathynophrys* Förster.

20. Areolet sessile; metathorax with the apical transverse carina present, distinct. (Female) ....(327) *Alloplasta* Förster.

Areolet petiolate.

Areolet small, oblique, open behind; metathoracic spiracles small, oval; claws strongly pectinate .... (328) *Ctenopimpla* Cameron.

21. Areolet petiolate or subpetiolate 24

Areolet sessile.

Areolet triangular or rhomboidal 22

Areolet irregularly pentagonal.

Clypeus at base posteriorly strongly impressed, the impression often so covered with long hairs as to form a tuft ... (321) *Ensimus* Förster.

22. Disco-cubital nervure strongly curved, but not broken by a stump of a vein. 23

Disco-cubital nervure angularly broken a little before the middle.

Transverse median nervure in hind wings broken a little *below* the middle; clypeus anteriorly rounded; claws very long, not pectinate, but ciliate with bristles within. (Male) (p. 51) (327) *Alloplasta* Förster.

23. Median and submedian cells of an equal length; transverse median nervure in hind wings obtusely angularly broken near the apical third. (South America) .... (329) *Epimecoideus* Ashmead, new genus.

(Type *Epimecoideus apicalis* Ashmead, manuscript.)

Median and submedian cells unequal; transverse median nervure in the hind wings broken *below* the middle.

Clypeus prominent, separated and in outline semicircular; metathoracic spiracles short oval; areolet oblique, rhomboidal.

(330) *Pimplopterus* Ashmead, new genus.

(Type *Pimplopterus alaskensis* Ashmead, manuscript.)

24. Disco-cubital nervure strongly curved or bent, but never angularly broken, and *without* a stump of a vein 25

Disco-cubital nervure angularly broken, or *with* a stump of a vein.

Disco-cubital nervure angularly broken at the basal third.

(331) *Stenolabis* Kriechbaumer.

Disco-cubital nervure *not* angularly broken but still broken by a stump of a vein near its middle; metathoracic spiracles elliptical, thrice as long as wide; abdominal segments all longer than wide.

(332) *Meyva* Cameron.

25. Metanotum *with* two delicate parallel, or nearly, carinæ down the center, the spiracles rounded; abdominal segments 1–3 longer than wide, the first more than twice longer than wide, 5–6 wider than long, the last very short; transverse median nervure in hind wings broken below the middle .... (333) *Harrimaniella* Ashmead, new genus.

(Type, *Harrimaniella yukakensis* Ashmead, manuscript.)

Metanotum *without* such carinæ, the spiracles small, rounded; third abdominal segment a little wider than long, the first narrowed toward base more than twice longer than wide at apex. (See p. 51.)

(319) *Cryptopimpla* Taschenberg.

Tribe IV. PIMPLINI.

1868. *Pimploidæ*, Family 15, Förster, Verh. d. naturh. Ver. pr. Rheinl., XXV, pp. 142 and 162.

1894. *Pimplini*, Tribe III, Ashmead, Proc. Ent. Soc. Wash., III, p. 278.

1900. *Pimplini*, Tribe IV, Ashmead, Smith's Insects of New Jersey, p. 572.

In this tribe are to be found some of the largest, if not the largest species, of all the parasitica.

The group is a most extensive one, and includes several well-known genera of a world-wide distribution, and among which are such conspicuous genera as *Rhyssa* and *Thalessa*, commonly known as the Long-Stings.

The species belonging to these two genera destroy the xylophagous saw-flies belonging to the genera *Sirex*, *Paururus Tremex*, etc., which bore and live in the interior of various forest trees, and in order to reach their hosts their ovipositor has become enormously developed, attaining sometimes the length of 5, 6, or more inches. Undoubtedly this group is closely allied to the *Lissonotini*, and some authorities would unite the two groups; but I agree with Förster in thinking the *Pimplini* distinct since they may be readily separated by the sculpture of the abdomen, the transverse impressions or furrows on the segments and particularly by the lateral impressed lines on segments 2 to 5, which are never present in the *Lissonotini*.

Sixty-one genera have been recognized in the group separable as follows:

TABLE OF GENERA.

Mesonotum *not* transversely rugose 4
Mesonotum transversely rugose.
  Areolet in front wings present.. 2
  Areolet in front wings wanting.
(334) *Epirhyssa* Cresson=*Rhyssonota* Kriechbaumer.
(Type, *Epirhyssa speciosa* Cresson.)

2. Metathorax *not* areolated; head *without* a carina between the antennæ 3
  Metathorax areolated; head sometimes *with* a carina between the antennæ.
    Head *with* a strong carina between the antennæ; transverse median nervure straight, *not* broken, the subdiscoidal nervure originating from the median vein far beyond the apex of the submedian cell.
(335) *Apechneura* Kriechbaumer.
(Type, *Rhyssa terminalis* Brullé.)
    Head *without* a carina between the antennæ.
(336) *Certonotus* Kriechbaumer.
(Type, *Certonotus varius* Kriechbaumer.)

3. Transverse median nervure in hind wings broken far *above* the middle, or the subdiscoidal nervure originates from the angle formed by the transverse median and the median veins.
    Head with the temples broad, well developed, nearly the width of the eyes; hind tarsi much elongated, very much longer than their tibiæ; abdomen in female compressed toward apex.
      Clypeus anteriorly medially lengthened or unidentate; abdominal segments at apex either rounded or emarginate.
(337) *Rhyssa* Gravenhorst.
(Type, *Ichneumon persuasorius* Linnæus.)
      Clypeus anteriorly truncate; abdominal segments in male smooth, with segments 3–7 at apex emarginate or deeply excavated.
(338) *Thalessa* Holmgren.
(Type, *Ichneumon clavator* Fabricius.)
    Head with the temples very narrow, scarcely half the width of the eye; hind tarsi normal, hardly longer than their tibiæ; abdomen depressed.
(339) *Lytarmes* Cameron.
(Type, *Lytarmes maculipennis* Cameron.)

4. Second abdominal segment in female usually much longer than wide, rarely quadrate at apex; ovipositor most frequently longer than the body . . . 5

Second abdominal segment in female transverse or quadrate, seldom a little longer than wide; ovipositor usually shorter than the body 9

5. Antennæ normal, the joints 3 to 5 outwardly *not* serrate 6

Antennæ with the joints 3 to 5 outwardly serrate.

Abdomen with segments 1–7 longer than wide, with indistinct lateral swellings; transverse median nervure in hind wings faintly broken below the middle; thorax for the greater part red.

(340) *Troctocerus* Woldstedt.

(Type, *Troctocerus elegans* Woldstedt.)

6. Abdomen in both sexes nearly of an equal width throughout, the sides parallel or nearly, the sculpture of the anterior segments not different from that of the posterior segments, or only slightly; disco-cubital nervure straight, curved or angulated 7

Abdomen in female spindle-shaped or tapering toward base and apex, the sides not nearly parallel; in male straight, broad cylindrical.

Segments 2–3 in female or 2–5 in male with oblique furrows; disco-cubital nervure angulate and with a short stump of a vein; ovipositor somewhat shorter than the body . . . . . (341) *Atractogaster* Kriechbaumer.

(Type, *Atractogaster semisculptus* Kriechbaumer.)

7. Claws in female simple, *without* a tooth at base; last joint of hind tarsi at least thrice as long as the preceding; male with the inner margin of the eyes deeply emarginate 8

Claws in female cleft or with a strong tooth at base; last joint of hind tarsi longer than the preceding; male with the inner margin of the eyes *not* distinctly emarginate.

Transverse median nervure in hind wings broken *above* the middle; metathoracic spiracles oval or elongate . . . . (342) *Ephialtes* Gravenhorst.

(Type, *Ephialtes tuberculatus* Gravenhorst.)

Transverse median nervure in hind wings broken *at* or *below* the middle; metathoracic spiracles small, round.

(343) *Calliephialtes* Ashmead, new genus.

(Type, *Pimpla xanthothorax* Ashmead.)

8. Metathorax smooth, shining, *without* punctures; areolet in front wings rhomboidal, *not* petiolate; transverse median nervure in hind wings broken *above* the middle . . . . (344) *Perithous* Holmgren.

(Type, *Pimpla divinator* Gravenhorst.)

Metathorax punctate, and medially irregularly, transversely rugulose, evanescent toward the sides; a subsemicircular area posteriorly; areolet in front wings small, petiolate; disco-cubital nervure arcuate.

(345) *Opisorhyssa* Kriechbaumer.

(Type, *Opisorhyssa flavopicta* Kriechbaumer.)

9. Abdomen distinctly punctate, or coriaceous, or at least never perfectly smooth, shining, or impunctate 15

Abdomen perfectly smooth, shining, impunctate, or at the most feebly alutaceous.

Areolet always present 11

Areolet wanting 10

10. Eyes very large, occupying the whole sides of the head, the temples usually flat; ocelli large, prominent; claws with a tooth toward base beneath.

Prothorax narrowed into a neck anteriorly; eyes convergent anteriorly; temples flat or oblique . . . . (346) *Epimeces* Brullé.

(Type, *Epimeces bicolor* Brullé.)

Prothorax *not* narrowed into a neck anteriorly; eyes *not* convergent anteriorly; temples neither flat nor oblique.....(347) *Eugalta* Cameron.
(Type, *Eugalta strigosa* Cameron.)

11. Eyes with the inner margin emarginate or subemarginate; middle vein in hind wings distinct to the base................................. 12

Eyes with the inner margin entire, *not* at all emarginate; middle vein in hind wings sometimes obsolete at base.

Middle vein in hind wings distinct to base; metathorax areolated.

Metathorax irregularly transeversely striate, and with a shallow median furrow on the basal three-fourths.
(348) *Pseudeugalta* Ashmead, new genus.
(Type, *Eugalta spinosa* Cameron.)

Metathorax smooth and polished, *without* a median furrow, the spiracles small, round; disco-cubital nervure not broken by a stump of a vein; transverse median nervure in hind wings broken *below* the middle............(Africa) (349) *Zonopimpla* Ashmead, new genus.
(Type, *Zonopimpla albicincta* Ashmead, manuscript.)

Middle vein in hind wings toward base obselete; metathorax more or less distinctly areolated, the areola and the petiolar area confluent; hind femora not much swollen; ovipositor longer than the abdomen.
(350) *Idiogamma* Förster.
(Type, *Idiogamma euryops* Förster.)

12. Mesonotum *with* sharply defined parapsidal furrows, which converge and meet before attaining the base of the scutellum; claws stout, simple; metathorax with the upper hind angles toothed, *without* an areola, but with a distinct petiolar area; hind femora with a small tooth beneath toward apex; transverse median nervure in hind wings broken *far above* the middle.... (351) *Lissopimpla* Kriechbaumer.
(Type, *Lissopimple 8-guttata* Kriechbaumer.)

Mesonotum *without* distinct parapsidal furrows, either entirely wanting or only vaguely defined anteriorly; hind femora more or less thickened; ovipositor at most never larger than the abdomen, usually shorter.

Claws simple, *not* pectinate.. 14

Claws very large, strongly pectinate................................ 13

13. Metathorax *with* a distinct areola and a petiolar area.. (352) *Theronia* Holmgren.
(Type, *Pimpla flavicans* Fabricius.)

Metathorax *without* either an areola or a petiolar area.

Head normal, the malar space short........... (353) *Neotheronia* Krieger.
(Type, *Theronia tolteca* Cresson.)

Head subrostriform, the malar space long. (See p. 57.)
(366) *Echthromorpha* Holmgren.

14. Metathorax exareolated but with a strong transverse apical area, the upper hind angles dentate or tuberculate; hind femora unarmed. (New Zealand.)................ (354) *Allotheronia* Ashmead, new genus.
(Type, *Allotheronia 12-guttata* Ashmead, manuscript.)

15. Last joint of antennæ *not* longer than the two preceding joints united; last joint of hind tarsi two or more times longer than the preceding joint. 16

Last joint of antennæ large, oblong, longer than the two preceding joints united; last joint of hind tarsi not fully twice as long as the preceding joint.

Face clothed with long silvery hairs; scutellum only slightly margined at sides; metathorax areolated..................(355) *Stilbops* Förster.
(Type, *Pimpla veluta* Gravenhorst.)

16. Clypeus distinctly separated; eyes rarely hairy.......................... 18

Clypeus *not* separated; eyes either hairy or bare, with their inner margin entire, or at most only slightly emarginate.......................... 17

17. Eyes hairy; mesonotum *with* distinct parapsidal furrows; abdomen narrow, the first segment bicarinate, the last ventral segment short; ovipositor not long; wings *without* an areolet...(356) *Schizopyga* Gravenhorst.
(Type, *Schizopyga podagrica* Gravenhorst.)

Eyes bare; mesonotum with the parapsidal furrows indicated only anteriorly; abdomen as in *Pimpla*, the first segment bicarinate.

Metathorax not areolated, the spiracles long; ovipositor longer than the abdomen; claws with a strong angular tooth at base.
(357) *Hemipimpla* Saussure.

Metathorax areolated, the spiracles small, oval or elliptic; ovipositor shorter than the abdomen; claws simple *without* a tooth at base; areolet in front wings wanting (Africa).
(358) *Neopimpla* Ashmead, new genus
(Type, *Neopimpla abbottii* Ashmead, manuscript.)

18. Wings *with* an areolet.. 19
Wings *without* an areolet.. 31

19. Claws *not* pectinate, or only faintly and indistinctly.................... 20
Claws strongly pectinate.

Metathorax with a transverse apical carina, the spiracles linear; first abdominal segment bicarinate; stigma narrow, the radius originating before its middle, the areolet large, tetragonal, briefly petiolate; clypeus convex; mesonotum with furrows anteriorly.
(359) *Odinophora* Förster.

20. Abdominal segments with *transverse* impressions, especially laterally near apex on segments 2–4.. 21
Abdominal segments with strong *oblique* impressions or grooved lines.

Areolet large, tetragonal; abdominal segments 2–3 only with oblique impressions; transverse median nervure in hind wings broken at the middle ....(360) *Dyspetes* Förster.

Arrolet small, petiolate, not rhomboidal; abdominal segments 2–4, with oblique impressions.

Forehead with two horns; scutellum black; abdomen banded with white...............................(361) *Hoplitophrys* Förster.
(Type, *Glypta brischkei* Holmgren.)

Forehead with one horn; scutellum and the extreme apical margins of the segments yellow; transverse median nervure in hind wings broken above the middle..................(362) *Teleutea* Förster.
(Type, *Glypta striata* Gravenhorst.)

21. Metathorax *not* areolated.. 22
Metathorax areolated, or at least with a complete areola and a petiolar area.

Scutellum normal ....(363) *Delomerista* Förster.
(Type, *Pimpla mandibularis* Gravenhorst.)

Scutellum conically elevated and margined at sides; transverse median nervure in hind wings broken far above the middle.
(364) *Xanthopimpla* Saussure.
(Type, *Xanthopimpla nova* Saussure.)

22. Clypeus more or less distinctly separated from the face at base............ 23
Clypeus *not* separated from the face at base.

Clypeus anteriorly semicircularly emarginate; abdominal segments 2–5, with deep, transverse furrows at base and apex, which are united with an impression along the sides; metathorax smooth, exareolated, without a trace of carinæ; claws strong, with a large tooth or lobe at base; transverse median nervure in hind wings broken very *far*

below the middle; areolet in front wings oblique, rhomboidal. (Lower Siam) ....(365) *Erythropimpla* Ashmead, new genus
(Type, *Erythropimpla abbottii* Ashmead, manuscript.)

23. Clypeus impressed anteriorly at apex 25
Clypeus *not* impressed anteriorly at apex.
First abdominal segment with a hump-like elevation toward the apex.. 24
First abdominal segment normal, *without* a hump-like elevation.
Head subrostriform, with a broad malar space; eyes slightly convergent anteriorly and subemarginate within; areolet petiolate, the submedian cell longer than the median; transverse median nervure in hind wings *not* broken, the subdiscoidal nervure interstitial.
(366) *Echthromorpha* Holmgren.
(Type, *Echthropimpla maculipennis* Holmgren.)
Head normal, not subrostriform; eyes entire, not convergent anteriorly; transverse median nervure in hind wings broken, the subdiscoidal nervure not being interstitial ....(367) *Tromatobia* Förster.
(Type, *Pimpla variabilis* Holmgren.)

24. Head normal; abdominal segments 2–4, with a transverse impression laterally near apex and with oblique lateral impressions at base; submedian cell longer than the median, the disco-cubital nervure *not* broken, the areolet rather large, sessile; metathoracic spiracles oval. (Hawaii.) ....(368) *Glyptogastra* Ashmead, new genus.)
(Type, *Glyptogastra hawaiiensis* Ashmead, manuscript.)

25. Transverse median nervure in hind wings broken, the subdiscoidal nervure not interstitial 26
Transverse median nervure in hind wings straight, *not* broken.
Metathoracic spiracles small, round; hind femora normal; second abscissa of the radius straight, the median and submedian cells equal in length ....(369) *Tromera* Förster.
(Type, *Pimpla pomorum* Ratzeburg.)

26. Metathoracic spiracles round.. 29
Metathoracic spiracles linear, oval or reniform.
Claws in female *with* a tooth beneath 28
Claws in female simple, *without* a tooth 27

27. Metanotum with two elongate more or less distinct areas; head subrostrate; antennæ with the joints toward apex nodosely incrassated. (Male.)
(366) *Echthromorpha* Holmgren=*Polyamma* Kriechbaumer.
Metanotum *without* areas and *without* a transverse apical carina; head and antennæ normal; transverse median nervure in hind wings broken above the middle ....(370) *Pimpla* Fabricius.
Metanotum exareolated, but with a distinct transverse apical carina; head and antennæ normal; areolet trapezoidal, subpetiolate; transverse median nervure in hind wings obtusely angularly broken *above* the middle ....(371) *Notopimpla* Kriechbaumer.
(Type, *Pimpla terminalis* Brullé.)

28. Eyes in both sexes deeply emarginate within; lateral ridges of the mesonotum extending on to the scutellum; ovipositor directed upward at tip.
(372) *Apechthis* Förster.
(Type, *Pimpla rufata* Gravenhorst.)
Eyes *not*, or scarcely, emarginate within; lateral ridges of the mesonotum *not* extending on to the scutellum; ovipositor at tip straight.
(373) *Exeristes* Förster.
(Type, *Pimpla roborator* Gravenhorst.)

29. Claws *without* a tooth beneath 30

Claws *with* a tooth beneath at base.

Transverse median nervure in hind wings broken *far above* the middle and almost at a right angle ....(374) *Iseropus* Förster.

(Type, *Pimpla holmgreni* Schmideknecht.)

Transverse median nervure in hind wings broken *at* or *below* the middle, seldom a little above, but usually at a very obtuse angle.

(375) *Epiurus* Förster.

(Type, *Pimpla brevicornis* Gravenhorst.)

30. The sharp lateral ridges of the mesonotum extend on to the scutellum; transverse median nervure in hind wings broken *before* the middle, but always at a right angle ....(376) *Itoplectis* Förster.

(Type, *Pimpla maculata* Gravenhorst.)

The sharp lateral ridges of the mesonotum do not extend on to the scutellum; transverse median nervure in hind wings broken at an obtuse angle at or before the middle.m...............(377) *Eremochila* Förster.

(Type, *Pimpla ruficollis* Gravenhorst.)

31. Transverse cubital nervure variable, rarely much longer than the basal abscissa of the cubitus; scutellum rounded.............................. 32

Transverse cubital nervure much longer than the basal abscissa of the cubitus, i. e., the part lying between the disco-cubital nervure, or first recurrent, and the second recurrent; scutellum tetragonal, truncate posteriorly, marked with yellow; segments 2–4, with two oblique lines and with a transverse line before the apex; ovipositor shorter than the abdomen........................(378) *Lycorina* Holmgren.

(Type, *Lycorina triangulifer* Holmgren.)

32. Front femora not especially thickened, not excised........................ 33

Front femora gradually swollen before the middle to the tip and excised, their tibiæ bent at the base, the last joint of tarsi stout with strong claws; abdomen narrow, smooth, the first segment longer than wide, bicarinate; ovipositor scarcely as long as the first segment.

(379) *Colpomeria* Holmgren.

(Type, *Colpomeria lævigator* Holmgren.)

33. Abdominal segments 2–4, *without* oblique impressions; claws simple or rarely pectinate 36

Abdominal segments 2–4, *with* oblique impressions or grooved lines; claws pectinate, rarely simple.

Claws not strongly and thickly pectinate.............................. 34

Claws strongly and thickly pectinate..............(380) *Ctenochira* Förster.

(Type, *Ctenochira bisinuator* Förster.)

34. Frons *with* one or two tubercles or horns.................................. 35

Frons normal, *without* a tubercle or horn.

Metathorax more or less incompletely areolated; first joint of the flagellum much longer than the second; claws simple, or at most with the hind claws thinly pectinate toward base.

(381) *Glypta* Gravenhorst.

(Type, *Glypta teres* Gravenhorst.)

35. Frons with *one* tubercle or horn; metathorax more or less areolated with two median carinæ and two large lateral areas at base; first joint of flagellum elongate; claws pectinate toward base.

(382) *Conoblasta* Förster.

Frons with *two* tubercles or horns; metathorax exareolate, with only the apical transverse carina present; first joint of flagellum much elongate, nearly as long as joints 2–3 united; claws long, pectinate within.

(383) *Diplastomorpha* Förster.

36. Metathorax *not* completely areolated 37

Metathorax completely areolated.

Clypeus quite depressed; vertex very narrow; eyes strongly convergent anteriorly; areolet defined but open behind; abdomen with transverse impressions only on the first four segments; ventral valve somewhat prominent, but still far from tip of the abdomen.
(384) *Panteles* Förster.

Clypeus subconvex; vertex broad; eyes not convergent anteriorly; areolet wholly wanting, the submedian cell longer than the median, the transverse median nervure in hind wings broken far below the middle; abdomen *without* transverse impressions, closely punctate, opaque ....(385) *Polysphinctomorpha* Ashmead, new genus.
(Type, *Polysphinctomorpha luggeri* Ashmead, manuscript).

37. Abdomen as in *Pimpla*, the terminal tergites not prolonged ventrally and *not* inclosing or hiding the terminal urites 38

Abdomen with the terminal tergites prolonged beneath and hiding the terminal urites, or forming a cylinder from which projects the hypopygium that extends far beyond the tip of the abdomen; face not narrowed toward the mouth; eyes not, or only faintly, emarginate within; legs moderately stout, the claws long, pectinate; ovipositor scarcely half the length of the abdomen; body always marked with red.
(386) *Clistopyga* Gravenhorst.

38. Transverse cubital nervure present, the first abscissa of the cubitus forming with it a distinct angle.................................... 39

Transverse cubital nervure wanting, the first branch of the cubitus being interstitial with the first abscissa of the radius.

Transverse median nervure in hind wings broken; abdomen with the impressions on the segments very feeble or faint.
(387) *Acrodactyla* Haliday = *Oxyrrhexis* Förster.

Transverse median nervure in hind wings straight, *not* broken; abdomen with the impressions on the segments distinct.
(388) *Zatypota* Förster.

39. Clypeus normal, not projecting into a snout-like ledge anteriorly............ 40

Clypeus abnormal, as viewed from the side, projecting forward into a snout-like ledge.

Abdomen subpetiolate, closely opaquely punctate, the segments without distinct, transverse impressions; transverse median nervure in hind wings broken far below the middle.
(389) *Zarhynchus* Ashmead, new genus.
(Type, *Tryphon ? nasutus* Cresson.)

40. Face medially tuberculate; mesonotum trilobed; metanotum very short, with an apical transverse carina, slightly interrupted medially, the posteriorly face very finely, transversely striate; metanotum and the first four abdominal segments clothed with a dense sericeous pubescence.......................(390) *Sisyrostolus* Kriechbaumer.

Face normal; mesonotum not trilobed.

Metanotum with a central longitudinal furrow; abdomen with the transverse impressions on the segments well defined, the first segment much longer than wide at apex; last joint of tarsi thickened immediately from the base, not longer than the third; basal joint of hind tarsi not longer than the two following joints; onychium large, unusually developed..............(391) *Polysphincta* Gravenhorst.

Metanotum *without* an areola, at apex trilobed or clavate; abdomen with the transverse impressions *not* sharply defined, the first segment not longer than wide at apex; last joint of tarsi somewhat thickened at tip only, or in male not at all thickened, longer than the three preceding joints, in male longer than the second; onychium not unusually developed ....(392) *Zaglypta* Förster.

Tribe V. XORIDINI.

1859-60. *Xorides*, Subfamily, Holmgren, Kongl. Vets.-Akad. Handl., III, p. 6.
1868. *Xoridoidæ*, Family 18, Förster, Verh. d. naturh. Ver. pr. Rheinl., XXV. pp. 142 and 168.
1894. *Xoridini*, Tribe IV, Ashmead, Proc. Ent. Soc. Wash., III, p. 278.
1900. *Xoridini*, Tribe V, Ashmead, Smith's Insects of New Jersey, p. 575.

This tribe is distinguished by the shape of the head, which is quadrate, the temples being broad, and by the peculiar mouth opening, formed by the projecting mandibles and the concave or depressed clypeus, somewhat similar to the mouth opening found in Wesmael's division *Cyclostomi* in the family *Braconidæ*.

I have included in the tribe the genera *Echthrus* and *Nyxeophilus*, which most authorities place in the subfamily *Cryptinæ*, and which seem to form a transition between them and the *Pimplinæ*. They are placed here on account of the position of the spiracles of the first abdominal segment, which are placed *at* or a little *before* the middle, and not *beyond* the middle, as in all genuine Cryptines. The inflated front tibiæ, too, is a character frequently found in this group and rare in the *Cryptinæ*.

The group, as a whole, seems to confine itself to attacking the larvæ of wood-boring Coleoptera.

Twenty-four genera have been placed here, distinguished as follows:

TABLE OF GENERA.

Areolet in front wings wanting, or small, triangular, or rhomboidal, never large or pentagonal 6

Areolet in front wings large, pentagonal, or at most subtriangular or subtrapezoidal; anterior tibiæ in female usually inflated, constricted at base; abdomen petiolate or subpetiolate 2

2. Transverse median nervure in hind wings broken *far* below the middle; disco-cubital nervure in front wings not broken by a stump of a vein.. 4

Transverse median nervure in hind wings broken *at* or a little *above* the middle; disco-cubital nervure broken by a stump of a vein.

Transverse median nervure in front wings interstitial with the basal nervure, the median and submedian cells therefore of an equal length 3

Transverse median nervure in front wings originating *before* the basal nervure, the submedian cell therefore shorter than the median; metathorax with two transverse carinæ, the spiracles long oval; dorsal carinæ of first abdominal segment distinct to near the apex. (393) *Nyxeophilus* Förster.

3. Metathorax exareolated, at most with only one transverse carina—the apical; spiracles linear; dorsal carina of first abdominal segment wanting or indicated only at base ....(394) *Echthrus* Gravenhorst.

4. Head transverse, the temples narrow 5

Head quadrate, the temples broad.

Metathorax exareolated, with one transverse carina—the basal; spiracles small, rounded; submedian cell longer than the median, the areolet rather small pentagonal; first abdominal segment short, usually shorter than the second ....(395) *Holcostizus* Förster.

Metathorax with a median area which is, however, confluent with the petiolar area; submedian cell shorter than the median; first abdominal segment *not* short, distinctly petiolate.
(396) *Cubocephalus* Ratzeburg.

5. Metathorax areolated.

Scutellum rather flat; anterior tibiæ deformed, femora incrassated; areolet pentagonal........................ (397) *Dyseidopus* Kriechbaumer.

Scutellum gibbous; anterior tibiæ subinflated, constricted at base; areolet oblique; subrhomboidal........... (398) *Microtritus* Kriechbaumer.

6. Not all the femora short and much swollen, the hind femora always unarmed. 7

All the femora short and much swollen, the hind femora sometimes armed with a tooth beneath.

Metathorax areolated; front wings *without* an areolet; abdomen petiolate, the ovipositor longer than the abdomen.

Hind femora armed with a strong tooth beneath; upper hind angles of metathorax toothed or spined.....(399) *Odontomerus* Gravenhorst.

Hind femora unarmed but much swollen; hind angles of metathorax normal, not toothed.... (400) *Anodontomerus* Ashmead, new genus.
(Type, *Aplomerus tibialis* Provancher.)

7. Frons simple, *not* horned.. 8

Frons with a prominent horn or excrescence.

Mesonotum with distinct furrows; metanotum areolated; abdomen petiolate, the ovipositor as long as the abdomen.
(401) *Ischnoceros* Gravenhorst.

8. Front wings *without* an areolet, the areolet entirely absent.

Abdomen distinctly sessile... 12

Abdomen distinctly petiolate.

Second recurrent nurvure *not* angularly broken by a stump of a vein.
(402) *Clepticus* Haliday.
(Type, *Clepticus prætor* Haliday.)

Second recurrent nervure angularly broken by a stump of a vein; stigma scarcely developed; transverse median nervure in hind wings angularly broken near the middle; legs long....(403) *Epixorides* Smith.
(Type, *Epixorides chalybeator* Smith.)

Front wings *with* an areolet, rarely open behind.

Mandibles of an equal length; body stouter and not so elongate 9

Mandibles of an unequal length; body slender and elongate.

Head not much swollen, subquadrate; metathorax exareolated; abdomen slender; the ovipositor at the most as long as the abdomen; legs very slender, the hind pair lengthened ....(404) *Calliclisis* Förster.

9. Clypeus medially lamellate or toothed; metathorax exareolated, or at most with longitudinal carinæ, rarely indistinctly areolated.

Areolet completely closed... 10

Areolet open behind.

Clypeus anteriorly medially lamellate or toothed; metathorax indistinctly areolated...............................(405) *Perosis* Förster.

10. Temples posteriorly simple, not tuberculate................................. 11

Temples posteriorly tuberculate...........(406) *Achorocephalus* Kriechbaumer.

11. Transverse median nervure in hind wings broken *below* the middle; front tibiæ moderately thickened but not inflated; middle mesothoracic lobe

not projecting above the lateral lobes; petiolar area widely open at the middle; wings often with a brown transverse band.
(407) *Xylophrurus* Förster.

Transverse median nervure in hind wings broken behind the middle; front tibiæ inflated, constricted at base; mesonotum trilobed, the middle lobe briefly caniculate; metathorax irregularly arcuately striate.
(408) *Gabunia* Kriechbaumer.

12. Metanotum *not* or very indistinctly areolated; all tibiæ slender or only slightly thickened; antennæ in female *without* stiff bristles or hairs; abdominal segments 2 and 3 *without* transverse impressions; legs slender, the posterior pair lengthened 17

Metanotum usually completely areolated, rarely exareolated; front tibiæ much thickened or inflated, constricted at base; antennæ in female *with* rather stiff bristles; abdominal segments 2 and 3 *with* a more or less distinct transverse impression.

Metanotum completely areolated 13

Metanotum *not* areolated .... (409) *Moansa* Tosquinet.

13. Antennæ in both sexes short and faintly hairy, the female alone with stiff bristles before apex 14

Antennæ in both sexes clothed with long shaggy hairs—in male entirely, in female only toward apex; female antennæ ringed with white; ovipositor longer than the abdomen .... (410) *Sterotrichus* Förster.

14. Transverse median nervure in front wings uniting with the median vein *beyond* the origin of the basal nervure; first abdominal segment without a transverse ridge before apex 15

Transverse median nervure in front wings originating *before* the basal nervure; first abdominal segment with a transverse ridge before apex.
(411) *Gonophorus* Förster.

15. First abdominal segment medially *not* emarginate 16

First abdominal segment medially more or less emarginate.
(412) *Xylonomus* Gravenhorst.

16. Second abdominal segment longer than wide .... (413) *Mœrophora* Förster.

Second abdominal segment *not* longer than wide.

Head behind the eyes inflated; antennæ in both sexes ringed with white; first abdominal segment with two complete carinæ; ovipositor as long as the body .... (414) *Sichelia* Förster.

Head behind the eyes *not* inflated; antennæ *not* ringed with white; first abdominal segment without complete carinæ.
(415) *Rhadina* Förster.

17. Face distinctly narrowed anteriorly; mandibles of an equal length; clypeus at apex strongly impressed; head broadened behind the eyes; abdomen more or less sessile, rarely somewhat petiolate.
(416) *Xorides* Gravenhorst.

Face *not* or scarcely narrowed anteriorly; mandibles of an unequal length; clypeus at apex flat, not impressed; head somewhat inflated, slightly narrowed behind the eyes; abdomen narrow, cylindrical, petiolated, with segments 1–5 in female, or 1–7 in male, longer than wide .... (417) *Pœmenia* Holmgren.

Subfamily IV. TRYPHONINÆ.

1887. *Tryphoninæ*, Subfamily, CRESSON, Syn. Hym. North America, p. 47.
1889. *Tryphonidæ*, Family, THOMSON, Opus. Ent., XIII, pp. 1429 and 1438.
1895. *Tryphoninæ*, Subfamily III, ASHMEAD, Proc. Ent. Soc. Wash., III, p. 277.
1897. *Tryphoninæ*, Subfamily, DAVIS, Trans. Am. Ent. Soc., XXIV, p. 193.
1900. *Tryphoninæ*, Subfamily IV, ASHMEAD, Smith's Insects of New Jersey, p. 575.

The straight, *never* elbowed, first abdominal segment, which is usually sessile, and the position of its spiracles, as well as the venation of the front wings, readily distinguish this subfamily from all except the *Pimplinæ* and the *Ophioninæ*. From the former it is easily separated, in the females, by the hidden, or, at most, subexserted, non-prominent ovipositor; from the latter by the much shorter, broader, non-compressed abdomen, and a totally different habitus.

Some males, however, are placed with the greatest difficulty, and may be easily confused with those to be found in both the abovementioned subfamilies.

I know of no good character to easily distinguish them, although the practiced eye, in most cases, is able to place them by comparing them for venational and metathoracic characters peculiar to the females, in the different groups.

The *Tryphoninæ* may be divided into ten minor groups or tribes, as follows:

TABLE OF TRIBES.

Posterior tibiæ with one or two apical spurs.......... 2
Posterior tibiæ *without* apical spurs.
  Second and third abdominal segments without lunulæ....Tribe II. CTENISCINI.
2. Posterior tibiæ with only *one* apical spur.......... 4
  Posterior tibiæ with *two* apical spurs.
    Abdomen sessile or subsessile, never distinctly petiolate.......... 3
    Abdomen distinctly petiolate.
      Claws simple, not pectinate..........Tribe I. MESOLEPTINI.
      Claws pectinate..........Tribe III. CTENOPELMINI.
3. Claws pectinate..........Tribe III. CTENOPELMINI.
  Claws simple, not pectinate.
    Mandibles bidentate..........Tribe IV. TRYPHONINI.
    Mandibles tridentate..........Tribe V. BASSINI.
4. Middle tibiæ with only *one* apical spur.......... 6
  Middle tibiæ with *two* apical spurs.
    Face normal, *not* swollen.......... 5
    Face abnormal, greatly swollen; hind femora usually short and much swollen.
      Scape lengthened, *not* short, globose.......Tribe VI. ORTHOCENTRINI.
      Scape short, globose..........Tribe VII. EXOCHINI.
5. Abdomen sessile; dorsum of first and second segments with *two* parallel carinæ. Tribe VIII. TYLECOMNINI.
  Abdomen petiolate, the petiole long; dorsum of second segment *without* carinæ; scutellum margined; areolet in front wings *not* large, subsessile, rhomboidal..........Tribe IX. SPHINCTINI.

6. Face and scutellum normal ....Tribe II. Ctenisoini (part).

Face scutatiform; scutellum quadrangular, margined laterally; abdomen long, sessile, the sides parallel or nearly, coarsely punctate; areolet in front wings usually large, lozengoidal, or diamond-shaped.
Tribe X. Metopiini.

Tribe I. MESOLEPTINI.

1855. *Tryphonides homalopi* Holmgren (part), Kongl. Svensk. Vet.-Akad. Handl., I, p. 98.
1868. *Mesoleptoidæ*, Family 35, Förster, Verh. d. naturh. Ver. pr. Rheinl., XXV, pp. 34 and 197.
1883. *Mesoleptina*, Tribus, Thomson (part), Opus. Ent., IX, pp. 876 and 906.
1894. *Mesoleptini*, Tribe I, Ashmead, Proc. Ent. Soc. Wash., III, p. 277.
1897. *Mesoleptini*, Tribe, Davis, Trans. Am. Ent. Soc., XXIV, p. 300.
1900. *Mesoleptini*, Tribe I, Ashmead, Smith's Insects of New Jersey, p. 575.

In having a distinctly petiolated abdomen this tribe agrees with *Ichneumoninæ*, *Cryptinæ*, and some in the *Ophioninæ;* from all, however, excepting some in the last mentioned, it is at once separated by the straight, *not* elbowed petiole, and by the position of the spiracles, which are placed *at* or *before* the middle, never behind, while from the few genera in the *Ophioninæ* having the spiracles similarly situated, it is readily distinguished by the *non-compressed* abdomen, and by the abdomen in the males not terminating in two long spines.

The only group in the subfamily *Tryphoninæ*, with which it could be confused, if the other characters made use of in my table are taken into consideration, is the tribe *Ctenopelmini*, but from this tribe it is separated by the simple, not pectinate, claws.

Thirty-six genera have been recognized, distinguishable by characters made use of in the following table:

TABLE OF GENERA.

Head transverse, the temples not broad, scarcely half as wide as the width of the eyes 6

Head quadrate, the temples broad, fully as broad as the width of the eyes.

The longer spur of hind tibiæ as long as or longer than the second joint of tarsi 3

The longer spur of hind tibiæ shorter than the second joint of tarsi.

Front wings *with* an areolet 2

Front wings *without* an areolet ....(418) *Spanotecnus* Förster.

2. Transverse median nervure in hind wings broken *below* the middle; metanotum incompletely areolated ....(419) *Eclytus* Holmgren.

Transverse median nervure in hind wings broken *above* the middle; metanotum completely areolated ....(420) *Ichnæops* Förster.

3. First recurrent nervure, or the disco-cubital nervure *not* angularly broken; head not unusually swollen 4

First recurrent nervure, or the disco-cubital nervure angularly broken; head very much swollen, the vertex posteriorly deeply emarginate.
(421) *Polyoncus* Förster.

4. Stigma broad; first joint of the flagellum *not* longer than the second; metathoracic spiracles round, and not lying nearer the external area than to the pleural area; first abdominal segment with deep lateral foveæ at base 5

Stigma narrow; first joint of the flagellum distinctly longer than the second; metathoracic spiracles linear and lying nearer the external area than to the pleural area; first abdominal segment usually without deep lateral foveæ at base ....(422) *Sychnoleter* Förster.

5. Transverse median nervure in hind wings broken *below* the middle.
(423) *Laphyroscopus* Förster.

Transverse median nervure in hind wings broken *at* or above the middle.
(424) *Perilissus* Förster.

6. Flagellum 35–40-jointed, usually somewhat thickened; abdomen in female with the last segment so emarginate that the ovipositor lies immediately upon the back 7

Flagellum not especially thick; abdomen in female with last segment normal or not emarginate 8

7. Metanotum at base exareolated; hypopygium in female very prominent.
(425) *Polycinetis* Förster.

Metanotum at base areolated.

Front wings *without* an areolet....................(426) *Homaspis* Förster.

Front wings *with* an areolet.

Second abdominal segment with two middle carina at base.
(427) *Notopygus* Holmgren.

Second abdominal segment *without* middle carinæ.
(428) *Prosmorus* Förster.

8. Hind femora normal 9

Hind femora thickened.

Ovipositor outwardly serrate....................(429) *Catoglyptus* Förster.

9. Cheeks entirely smooth, shining, neither coriaceous nor punctate.......... 10

Cheeks *not* entirely smooth, shining, either alutaceous, coriaceous, or punctate 11

10. Front wings *with* an areolet....................(430) *Gausocentrus* Förster.

Front wings *without* an areolet.

Occipital margin interrupted at the middle.......(431) *Lathiponus* Förster.

Occipital margin entire....................(432) *Phobetes* Förster.

11. Clypeus distinctly separated 12

Clypeus *not* separated.

Eyes small, flat, not arched above the level of the head.
(433) *Homalomma* Förster.

Eyes large, arched above level of the head......(434) *Hypocryptus* Förster.

12. Face strongly narrowed toward the mouth..............(435) *Rhæstes* Förster.

Face *not* strongly narrowed.

Abdominal segments 2–4 *not* twice as wide as long 13

Abdominal segments 2–4 twice as wide as long..(436) *Stiphrosomus* Förster.

13. First abdominal segment *with* lateral carinæ that extend from the spiracles to the tip 14

First abdominal segment *without* such carinæ 21

14. Front wings *with* an areolet 16

Front wings *without* an areolet.

Last joint of hind tarsi *not* so long as the third and also *not* pectinate... 15

Last joint of hind tarsi fully as long as the third and also pectinate.
(437) *Dizemon* Förster.

15. Radius originating somewhat *beyond* the middle of the stigma; metathorax completely areolated; abdomen entirely smooth; sheath of ovipositor very broad ....(438) *Callidiotes* Förster.

Radius originating *before* the middle of the stigma.

Fifth joint of hind tarsi scarcely as long as the fourth; claws not large; metanotum regularly areolated, the middle lateral area not separated from the angular area by a transverse carina.
(439) *Ipoctonus* Förster.

Fifth joint of hind tarsi distinctly longer than the fourth; claws long; metanotum *not* at all, or very incompletely, areolated.
(440) *Mesoleptus* Gravenhorst.

16. Last joint of hind tarsi either distinctly shorter than the third, or no longer and not pectinate.. 17

Last joint of hind tarsi as long or longer than the third and distinctly pectinate.
(441) *Hadrodactylus* Förster.

17. Clypeus *not* impressed at apex.. 18

Clypeus impressed at apex, faintly rounded; mesonotum and scutellum alutaceous and punctate......................(442) *Alexeter* Förster.

18. Clypeus *not* flat; external median area not prominently toothed............ 19

Clypeus flat; external median area prominently toothed; radius in front wings originating *beyond* the middle of the stigma.
(443) *Oxytorus* Förster.

19. Radius originating from the middle of the stigma; transverse median nervure broken beyond the middle; mesonotum and scutellum alutaceous and punctate..............................(444) *Symphobus* Förster.

Radius originating *before* the middle of the stigma.

Transverse median nervure in hind wings broken somewhat *above* the middle; mesonotum and scutellum alutaceous, punctured.......... 20

Transverse median nervure in hind wings broken *below* the middle; mesonotum and scutellum shining, punctured; antennæ *not* ringed with white................................(445) *Zemiodes* Förster.

20. Disco-cubital nervure broken by an erect stump of a vein; discoidal cell broader at base than the anal cell at apex; teeth of mandibles feebly split at apex; antennæ and hind tarsi *not* ringed with white.
(446) *Terozoa* Förster.

Disco-cubital nervure not broken and *without* a stump of a vein; discoidal cell *not* so wide at base as the anal cell at apex; teeth of mandibles not split; antennæ and hind tarsi ringed with white.
(447) *Himerta* Förster.

21. Clypeus *without* a transverse impression at apex 22

Clypeus *with* a transverse impression at apex.

Third joint of maxillary palpi with a small tooth just before the tip.
(448) *Genarches* Förster.

Third joint of maxillary palpi *without* a tooth before the tip, normal.
(449) *Diēdrus* Förster.

22. Front wings *with* an areolet 23

Front wings *without* an areolet ....(450) *Neleothymus* Förster.

23. Metathoracic spiracles round, or short oval, not distinctly ovate............ 24

Metathoracic spiracles distinctly and strongly ovate; scutellum with two sharp parallel carinæ at apex; transverse median nervure in front wings originating behind the basal nervure; antennæ and hind tarsi *not* ringed with white; mesonotum, scutellum, mesopleura, and hind coxæ distinctly punctured but not alutaceous.
(451) *Asymmictus* Förster.

24. Transverse median nervure in the front wings originating distinctly behind the basal nervure; antennæ and hind tarsi *not* ringed with white; mesonotum, scutellum, and mesopleura alutaceous.
(452) *Clepsiporthus* Förster.

Transverse median nervure in front wings originating usually before the basal nervure, rarely interstitial or slightly beyond it; antennæ and tarsi ringed with white; mesonotum, scutellum, mesopleura, and hind coxæ always alutaceous .... (453) *Euryproctus* Holmgren.

Tribe II. CTENISCINI.

1855. *Tryphonides homalopi* HOLMGREN (part), Svensk. Vet.-Akad. Handl., I, p. 98.
1868. *Exenteroidæ* FÖRSTER, Verh. d. naturh. Ver. pr. Rheinl., XXV, pp. 144 and 194.
1883. *Cteniscina*, Tribus, THOMSON, Opus. Ent., IX, pp. 875–880.
1894. *Exenterini*, Tribe II, ASHMEAD, Proc. Ent. Soc. Wash., III, p. 277.
1897. *Exenterini*, Tribe, DAVIS, Trans. Am. Ent. Soc., XXIV, p. 227.
1900. *Cteniscini*, Tribe II, ASHMEAD, Smith's Insects of New Jersey, p. 577.

This tribe is readily distinguished by the posterior tibiæ, except in a single case, *being entirely without apical spurs.* Five tribes only have the posterior tibiæ armed with a single apical spur, namely, the *Orthocentrini*, the *Exochini*, the *Tylecomnini*, the *Sphinctini*, and the *Metopiini*, the others having two apical spurs. Of those just mentioned, having but a single apical spur to the hind tibiæ, all, except the *Metopiini*, have, however, *two* apical spurs on the *middle* tibiæ, whereas the *Cteniscini* and the *Metopiini* have but *one.* The wonderful peculiarities of the face and scutellum in this last group, brought out in my table, will, however, enable a novice to distinguish it.

Twelve genera have been characterized in this group, distinguishable as follows:

TABLE OF GENERA.

Teeth of mandibles of an equal length 2
Teeth of mandibles of an unequal length.
  Clypeus anteriorly broadly truncate; claws at base very feebly pectinate or simple .... (454) *Acrotomus* Förster = *Delotomus* Holmgren.
  Clypeus anteriorly broadly rounded; claws strongly pectinate to beyond the middle .... (455) *Anisoctenion* Förster.
2. Claws *not* pectinate 8
  Claws pectinate.
    Lateral margins of first abdominal segment normal 3
    Lateral margins of first abdominal segment thrice emarginate. (456) *Tricamptus* Förster.
3. Front wings *with* an areolet 4
  Front wings *without* an areolet .... (457) *Eridolius* Förster.
4. Hind tibiæ *with* a single small apical spur. (458) *Microplectron* Förster = *Smicroplectrus* Thomson.
  Hind tibiæ *without* an apical spur, the apex crowned with several minute spines.
    Abdomen broadly sessile, the first segment strongly widened quite to the base, scarcely distinguishably wider at apex 5
    Abdomen almost petiolate, the first segment distinctly narrowed toward base .... (459) *Cteniscus* Haliday = *Exenterus* Hartig.
5. Metanotum with the areola sharply circumscribed and wider than long 6
  Metanotum with the areola *not* sharply circumscribed and wider than long. (460) *Picroscopus* Förster.

6. Metathoracic angles acutely spined or toothed 7
Metathoracic angles rounded, not toothed .... (461) *Diaborus* Förster.

7. Scutellum deeply and broadly excavated; petiolar area very large, wider than long; second dorsal abdominal segment with the oblique grooves broad rugose .... (462) *Excavarus* Davis.
Scutellum narrow oval; petiolar area rectangular; second dorsal abdominal segment with the oblique grooves feeble, scarcely indicated. (463) *Auderis* Davis.

8. First abdominal segment ear-like widened 9
First abdominal segment *not* ear-like widened .... (464) *Anecphysis* Förster.

9. Second abdominal segment at apex twice as wide as the first at apex. (465) *Exyston* Schiödte.
Second abdominal segment at apex hardly one and a half times as wide as the first at apex .... (466) *Actenonyx* Förster.

Tribe III. CTENOPELMINI.

1855. *Tryphonides homalopi* Holmgren (part), Svensk. Vet.-Akad. Handl., I, p. 98.

1868. *Ctenopelmoidæ*, Family 34, Verh. d. naturh. Ver. pr. Rheinl., XXV, pp. 145 and 195.

1894. *Ctenopelmini*, Tribe III, Ashmead, Proc. Ent. Soc. Wash., III, p. 277.

1900. *Ctenopelmini*, Tribe III, Ashmead, Smith's Insects of New Jersey, p. 577.

This tribe is exceedingly closely allied to the *Mesoleptini*, the only character discoverable, that may be depended upon to separate it, being the *pectinate*, not simple, claws. It comprises genera with both petiolate and sessile abdomen and thus affords a transition group between the tribes *Mesoleptini* and the *Tryphonini*.

Seventeen genera have been recognized, separable as follows:

TABLE OF GENERA.

Abdomen not distinctly petiolate, sessile or subsessile 7
Abdomen distinctly petiolate.
Claws with close, *long* teeth 2
Claws with *short*, distant teeth 4

2. Clypeus distinctly separated, the apex strongly impressed 3
Clypeus *not* distinctly separated, the apex *not* impressed .. (467) *Rhorus* Förster.

3. Front wings *without* an areolet .... (468) *Labroctonus* Förster.
Front wings *with* an areolet .... (469) *Ctenopelma* Holmgren.

4. First abdominal segment only slightly widened behind the spiracles, the following segments not as long as wide 5
First abdominal segment strongly widened behind the spiracles, the following segments as long as wide.
Claws rather stout, strongly pectinate; ovipositor straight; clypeus separated from the face by a deep furrow .... (470) *Oethophorus* Förster.
Claws with a distinct tooth below the apex; clypeus feebly separated. (471) *Sympherta* Förster.

5. Median nervure in hind wings distinct entire 6
Median nervure in hind wings obliterated toward base .. (472) *Phrudus* Förster.

6. Metanotum *not* regularly areolated, with only a poorly defined petiolar area; ocelli wider from each other than to the eye margin. (473) *Eczetesis* Förster.

Metanotum regularly areolated; ocelli nearer to each other than to the eye margin ....(474) *Prionopoda* Holmgren.

7. Hind tarsi normal, not much thickened.................................... 8

Hind tarsi much thickened.

Front wings *without* an areolet; head almost quadrate, the ocelli deeply concave ....(475) *Scolobates* Gravenhorst.

8. Ovipositor in female more or less distinctly visible; male antennæ normal or *not* strongly compressed and dilated at the middle............... 9

Ovipositor in female concealed, invisible; male antennæ strongly compressed and dilated at the middle.

(476) *Eumesius* Westwood = *Euceros* Gravenhorst.

9. Clypeal foveæ *not* clothed with a tuft of hairs.............................. 11

Clypeal foveæ clothed with a tuft of hairs 10

10. Front wings *with* an areolet.........................(477) *Erromenus* Holmgren.

Front wings *without* an areolet ....(478) *Trichocalymma* Förster.

11. Clypeus separated from the face by a distinct cross furrow................ 12

Clypeus *not* at all separated...........................(479) *Monoblastus* Hartig.

12. Claws thickly combed, especially at apex, *without* pectinations basally.

(480) *Ctenacme* Förster.

Claws *not* thickly combed at apex, *with* pectinations basally.

Vertex *not* separated from the occiput by a sharp keel.

(481) *Lathrolestes* Förster.

Vertex separated from the occiput by a sharp keel.

Front wings *with* an areolet ....(482) *Polyblastus* Hartig.

Front wings *without* an areolet ....(483) *Scorpiorus* Förster.

Tribe IV. TRYPHONINI.

1855. *Tryphonides homalopi* (part) HOLMGREN, Svensk. Vets.-Akad. Handl., I, p. 98.

1868. *Tryphonoidæ*, Family 36, FÖRSTER, Verh. d. naturh. Ver. pr. Rheinl., XXV, pp. 145 and.

1883. *Tryphonina*, Tribus, THOMSON, Opus. Ent., IX, pp. 875 and 895.

1889. *Euryproctides*, Subtribus, THOMSON, Opus. Ent., XIII, p. 1429.

1894. *Tryphonini*, Tribe IV, ASHMEAD, Proc. Ent. Soc. Wash., III, p. 277.

1897. *Tryphonini*, Tribe, DAVIS, Trans. Am. Ent. Soc., XXIV, p. 265.

1900. *Tryphonini*, Tribe IV, ASHMEAD, Smith's Insects of New Jersey, p. 578.

As at present characterized, this is the largest and most extensive group in the subfamily *Tryphoninæ*, and is susceptible of subtribal divisions. Its nearest allies are the *Ctenopelmini*, from which it is separated by the *simple*, not pectinate, claws. From the *Bassini* it is separated by the *bidentate*, not tridentate, mandibles, while from all the other tribes, having a sessile abdomen, it is separated by having *two* apical spurs on the middle tibiæ.

One hundred and eleven genera have been recognized, distinguishable by the characters made use of in the following table:

TABLE OF GENERA.

Antennæ more than 14-jointed; areolet of the front wings wanting, or if present, never pentagonal.. 2

Antennæ 14-jointed; areolet pentagonal, sometimes open behind; metathorax short, obliquely truncate posteriorly but smooth; exareolate, the spiracles small, round.............................(484) *Pammicra* Förster

2. Eyes *not* emarginate within.. 3

Eyes emarginate within....(485) *Ecclinops* Förster ?=*Acrogonia* Kriechbaumer.

3. First abdominal segment normal, the sides at base *not* ear-like widened...... 4

First abdominal segment abnormal, the sides at base strongly ear-like widened.

Disco-cubital nervure angularly broken by a stump of a vein, the areolet oblique, subpetiolate; transverse median nervure in hind wings angularly broken below the middle ....(486) *Otoblastus* Förster.

4. Front wings *without* an areolet, or if partially formed, open behind.......... 47

Front wings *with* an areolet.. 5

5. Disco-cubital nervure sometimes angularly bent, but rarely broken by a stump of a vein; metapleura *without* a tooth immediately above the hind coxæ.. 6

Disco-cubital nervure angularly broken by a stump of a vein; metathorax incompletely areolated, the metapleura *with* a tooth immediately above the hind coxæ; transverse median nervure in hind wings broken above the middle........................(487) *Protarchus* Förster.

5½. Areolet in front wings large, rather regularly formed, almost rhomboidal... 5½

Areolet in front wings not large, quite irregular, oblique, not rhomboidal, often petiolate.. 7

6. Abdominal segments without oblique impressions.

Abdomen normal, smooth ....(488) *Rhimphalea* Förster.

Abdomen compressed toward apex and longitudinally striate above; transverse median nervure in hind wings broken a little below the middle ....(489) *Westwoodia* Brullé.

7. Second abdominal segment *without* thyridia at base........................ 8

Second abdominal segment *with* distinct thyridia at base.................. 19

8. Second abdominal segment *without* lateral carinæ at base................... 9

Second abdominal segment with sharp lateral carinæ at base which extend to the spiracles...........(490) *Neoeryma* Ashmead=*Eryma* Förster.

9. Metanotum *without* areas.. 10

Metanotum *with* areas more or less complete.............................. 12

10. Spiracles of the first abdominal segment somewhat prominent; no carinæ extending from them to the apex of the segment............... 11

Spiracles of the first abdominal segment not prominent; with carinæ extending from them to the apex of segment.........(491) *Eriglœa* Förster.

11. Metapleura separated from the metanotum by a sharp carina; transverse median nervure in hind wings broken below the middle.

(492) *Labrossyta* Förster.

Metapleura *not* separated from the metanotum by a sharp carina, the carina absent; transverse median nervure in the hind wings broken *far* below the middle........................(493) *Polytrera* Förster.

12. Transverse median nervure in hind wings distinctly angularly broken...... 13

Transverse median nervure in hind wings straight, not broken.

(494) *Gnesia* Förster.

13. Transverse median nervure in hind wings broken *at* or *below* the middle.... 14

Transverse median nervure in hind wings broken *above* the middle.

Clypeus *not* distinctly separated; metathorax with a distinct areola.

(495) *Udenia* Förster.

Clypeus distinctly separated..................(496) *Otlophorus* Förster.

14. Metathorax completely areolated.. 15

Metathorax *not* completely areolated...................................... 17

15. Spiracles of first abdominal segment placed *at* or *before* the middle......... 16

Spiracles of first abdominal segment placed somewhat behind the middle.

(497) *Hodostates* Förster.

16. Abdominal segments 2 and 3 wider than long; transverse median nervure in hind wings broken *below* the middle.

Transverse median nervure in front wings not interstitial, uniting with the median vein behind the basal nervure; male antennæ *not* dilated beyond the middle.................(498) *Trematopygus* Holmgren.

Transverse median nervure in front wings interstitial with the basal nervure; male antennæ dilated beyond the middle. (499) *Baryceros* Gravenhorst.

Abdominal segments 2 and 3 not distinctly wider than long; transverse median nervure in hind wings broken exactly at the middle. (500) *Synagrypnus* Förster.

17. Clypeus *not* separated at base.. 18

Clypeus separated at base.

Mesonotum *with* distinct furrows anteriorly; longer spur of hind tibiæ not half as long as the basal joint of tarsi......(501) *Homobia* Förster.

Mesonotum *without* furrows anteriorly; longer spur of hind tibiæ longer than half the length of basal joint of tarsi. (502) *Zemiophora* Förster.

18. First abdominal segment *with* sharp carinæ extending from the spiracles to the apex ....(503) *Synocætes* Förster.

First abdominal segment *without* such carinæ. (504) *Amorphognathon* Förster.

19. Clypeus *not* transversely divided by an elevated line or ridge............... 26

Clypeus transversely divided by an elevated line or ridge, the anterior part somewhat abrupt or impressed, and also usually differently colored from the basal part.

Frons above the antennæ *with* a strong tubercle........................ 20

Frons above the antennæ normal, or *without* a tubercle................ 21

20. Frontal tubercle incised above; lateral clypeal foveæ clothed with long hairs. (505) *Cœloconus* Förster.

Frontal tubercle *not* incised above; lateral clypeal foveæ *not* clothed with long hairs..............................(506) *Cosmoconus* Förster.

21. Metanotum more or less completely areolated 22

Metanotum exareolate, entirely smooth.

Metanotum *without* longitudinal carinæ but *with* a strongly elevated transverse carinæ ....(507) *Psilosarge* Förster.

Metanotum *with* longitudinal carinæ but *without* an elevated transverse carina....................................(508) *Quadrigana* Davis.

22. Antennal fovea *with* an elevated margin..................................... 23

Antennal fovea *without* an elevated margin 24

23. Antennal fovea with an elevated margin above ....(509) *Otitochilus* Förster.

Antennal fovea with an elevated margin within......(510) *Symboëthus* Förster

24. Clypeus normal *without* teeth anteriorly................................... 25

Clypeus *with* two median teeth anteriorly................ (511) *Neleges* Förster.

25. Mandibles with the teeth of an equal length...... (512) *Tryphon* Gravenhorst.

Mandibles with the teeth of an unequal length.......(513) *Polyrhysia* Förster.

26. Transverse median nervure in hind wings broken *above* the middle 27

Transverse median nervure in hind wings broken *at* or *below* the middle.... 30

27. First abdominal segment *with* four strong elevations behind the middle. (514) *Narcopœa* Förster.

First abdominal segment *without* elevations behind the middle.

Lower tooth of mandibles not longer than the upper tooth; clypeus impressed or truncate anteriorly.. 28

Lower tooth of mandibles longer than the upper tooth.

Metathorax *without* an areola or a petiolar area; clypeus *with* a narrow, transverse furrow close to the front margin . . (515) *Isodiaeta* Förster.

Metathorax *with* a petiolar area which is separated by a median carina; clypeus *without* a transverse furrow anteriorly. (516) *Neales* Förster.

28. Clypeus posteriorly at base very strongly impressed, deeply dish-shaped 29

Clypeus behind the middle abrupt, anteriorly transversely impressed, the anterior margin strongly and broadly truncate, incised at the middle; first abdominal segment at base narrower than between the spiracles; carinæ extend from the spiracles to the apex of the segment: petiolar area with a sharp median carina. (517) *Zacalles* Förster.

29. First abdominal segment at extreme base *not* wider than between the spiracles; from each spiracle extends a fine carina to the apex of the segment; antennæ ringed with white . . . . (518) *Perispuda* Förster.

First abdominal segment at extreme base wider than between the spiracles; no carinæ from the spiracles . . . . (519) *Zaplethis* Förster.

30. Mandibles distinctly bidentate at apex 31

Mandibles gradually acute, *without* teeth . . . . (520) *Alcochera* Förster.

31. Areolet distinctly petiolate 33

Areolet not distinctly petiolate 32

32. Areolet sessile; mesonotum with deep parapsidal furrows anteriorily. (521) *Apimeles* Förster.

Areolet subsessile, not distinctly sessile.

Mesonotum *with* abbreviated parapsidal furrows anteriorly; clypeus *not* wider than long; head transverse; transverse median nervure in hind wings broken almost at the middle; lunulæ on segments 2 and 3 very distinct . . . . (522) *Laepserus* Förster.

Mesonotum *without* parapsidal furrows anteriorly; clypeus wider than long; head not transverse; transverse median nervure in hind wings broken *far* below the middle . . . . (523) *Epachthes* Förster.

33. Third abdominal segment longer than wide . . . . (524) *Lagarotis* Förster.

Third abdominal segment *not* longer than wide.

Mesopleura *without* a prominent tooth posteriorly 34

Mesopleura *with* a prominent tooth posteriorly . . . . (525) *Daspletis* Förster.

34. Metanotum more or less areolated 38

Metanotum not areolated 35

35. Lower tooth of mandibles *not* longer than the upper tooth 36

Lower tooth of mandibles much longer than the upper tooth. (526) *Azelus* Förster.

36. Transverse median nervure in hind wings broken *at* or a little *above* the middle, rarely a little below the middle 37

Transverse median nervure in hind wings broken distinctly *below* the middle. (527) *Adranes* Förster.

37. Fourth abdominal segment fully as long as the third . . (528) *Zaphthora* Förster.

Fourth abdominal segment shorter than the third.

Clypeus flat very slightly rounded anteriorly or nearly squarely truncate, *without* an impressed margin; lateral margins of second and third abdominal segments not curving upward . . (529) *Adexioma* Förster.

Clypeus medially emarginate, with a transverse impression, the same laterally before the emargination also incised; lateral margins of second and third abdominal segments acutely bent upward, the spiracles not lying close to the lateral margins . . . . . (530) *Lamachus* Förster.

38. Metanotum *not* completely areolated 41

Metanotum completely areolated 39

39. Last joint of the hind tarsi *not* longer than the third 40

Last joint of the hind tarsi longer than the third...(531) *Trophoctonus* Förster.

40. Clypeus *with* a transverse impression before the apex..(532) *Synomelix* Förster.

Clypeus *without* a transverse impression before the apex.
(533) *Gastroporus* Förster.

41. Clypeus *not* so impressed that the middle is produced into a tooth 42

Clypeus with a distinct transverse impression on the anterior margin, which projects medially into a more or less distinct tooth.
(534) *Pantorhæstes* Förster.

42. Clypeus forming a flat triangle with the longest side along the anterior margin.
(535) *Zapedias* Förster.

Clypeus *not* forming a flat triangle.

First abdominal segment *without* lateral carinæ, or if present never extending beyond the spiracles 43

First abdominal segment with two dorsal carinæ which extend beyond the spiracles.................................(536) *Dialges* Förster.

43. Frons *without* a middle carina; second and following abdominal segments not all smooth 44

Frons *with* a middle carina; second and following segments smooth.
(537) *Zemiophron* Förster.

44. Clypeus *not* transversely impressed before the tip 45

Clypeus transversely impressed before the tip, so that the anterior margin appears interrupted.

Stigma extremely narrow, the radius originating from its basal one-third; base of discoidal cell fully twice as wide as the apex of the second discoidal cell ....(538) *Oneista* Förster.

Stigma more or less narrowed, the radius originating at or before the middle, never from the basal third; base of discoidal cell *not* twice as wide as the second discoidal cell at apex. .... (539) *Dysantes* Förster.

45. Face and clypeus medially *not* swollen 46

Face and clypeus medially much swollen ....(540) *Noëmon* Förster

46. Longer spur of hind tibiæ *not* attaining half the length of the tarsus; third joint of hind tarsi scarcely longer than the last joint; second abdominal segment quadrate ....(541) *Paraplesius* Förster.

Longer spur of hind tibiæ attaining half the length of the tarsus; third joint of the hind tarsi much longer than the last joint; second abdominal segment not quadrate.

Mesonotum and scutellum strongly punctured, but shining; metathorax with the petiolar area very wide with a median carina; first abdominal segment with a very deep long furrow...(542) *Trysicampe* Förster.

Mesonotum and scutellum finely shagreened and finely punctured; metathorax with the petiolar area short, narrow, without a middle carina; first abdominal segment without a long furrow.
(543) *Nythophona* Förster.

47. Middle femora beneath, near the base, toothed.......(544) *Æolometis* Förster.

Middle femora beneath normal, not toothed.

Second abdominal segment *with* distinct thyridia...................... 59

Second abdominal segment *without* thyridia at base or the same lying so close to the base as to be entirely invisible 48

48. Transverse median nervure in hind wings broken *at* or *below* the middle.... 49

Transverse median nervure in hind wings broken *above* the middle.

Mesonotum anteriorly trilobed; metathorax with the areola not longer than the petiolar area; transverse median nervure in hind wings broken only a little above the middle........... (545) *Polypystis* Förster.

Mesonotum *not* lobed; metathorax with the areola longer than the petiolar area; transverse median nervure in hind wings broken *far* above the middle .... (546) *Xenonastes* Förster.

49. Metanotum completely areolated .... (547) *Sychnoportus* Förster.
Metanotum *not* completely areolated.
Occipital margin *not* interrupted medially 50
Occipital margin interrupted medially .... (548) *Asthenara* Förster.

50. Base of discoidal cell as wide or wider than the apex of the second discoidal cell 51
Base of discoidal cell not as wide as the apex of the second discoidal cell.
(549) *Camporychus* Förster.

51. Areolet entirely wanting 52
Areolet distinct in position but open behind.
Transverse median nervure in front wings originating from *before* the basal nervure; base of discoidal cell only twice as wide as the apex of the hind middle humeral cell; areolet very small; spiracles of the first abdominal segment placed somewhat behind the middle.
(550) *Trapezocora* Förster.
Transverse median nervure in front wings originating far *behind* the basal nervure; base of discoidal cell at least three times as wide as the apex of hind middle humeral cell; areolet very large, briefly petiolate, widely open behind; spiracles of the first abdominal segment placed before the middle .... (551) *Rhigelus* Förster.

52. Clypeus with the anterior margin *not* semicircularly emarginate 53
Clypeus with the anterior margin semicircularly emarginate or impressed.
Metathorax very short, abruptly truncate behind, and bounded above by a transverse carina; flagellum shaggy from short stiff hairs, the first joint longer than the second .... (552) *Cacotropa* Förster.

53. Metanotum more or less areolated 55
Metanotum *not* areolated 54

54. Spiracles of the first abdominal segment very prominent; second segment *with* distinct *lunulæ;* metasternum not margined; last joint of hind tarsi scarcely longer than the fourth, but distinctly shorter than the third .... (553) *Philotymma* Förster.
Spiracles of the first segment not at all prominent, the second segment *without lunulæ;* metasternum margined in part; last joint of hind tarsi decidedly longer than the fourth and as long as the third.
(554) *Scopesis* Förster.

55. First abdominal segment *with* lateral carinæ extending from the spiracles to apex of segment 56
First abdominal segment *without* lateral carinæ from the spiracles to apex of segment.
Second joint of hind trochanters normal .... (555) *Syndipnus* Förster.
Second joint of hind trochanters beneath flat and produced outwardly beyond the insertion of the femur .... (556) *Volucris* Davis.

56. Petiolar area of metathorax *without* a middle carina 57
Petiolar area of metathorax *with* a middle carina.
Teeth of mandibles of an equal length .... (557) *Listrota* Förster.
Teeth of mandibles unequal, the lower tooth the longer.
(558) *Tlemon* Förster.

57. Spiracular area sharply separated from the middle pleural area by a transverse carina 58
Spiracular area *not* separate from the middle pleural area by a transverse carina.
(559) *Polyterus* Förster.

58. Clypeus anteriorly *with* a very fine, narrow, interrupted margin. (560) *Atrestes* Förster.

Clypeus anteriorly *without* an interrupted margin.

Transverse median nervure in front wings originating *before* the basal nervure; base of discoidal cell twice as wide as the apex of the hind middle humeral cell ....(561) *Campogenes* Förster.

Transverse median nervure in front wings originating far *behind* the basal nervure; base of the discoidal cell thrice as wide as the apex of the hind middle humeral cell ....(562) *Aselasma* Förster.

59. Metanotum *not* completely areolated 60

Metanotum completely areolated 63

60. Clypeus medially *not* deepened dish-shaped, although sometimes transversely impressed anteriorly.. 61

Clypeus medially flat, deepened dish-shaped.

Transverse median nervure in hind wings broken a little above the middle; in front wings not quite interstitial with the basal nervure, the submedian cell slightly shorter than the median; mesonotal furrows deeply impressed anteriorly but converging and meeting at the middle of the mesonotum..............(563) *Pantoporthus* Förster.

61. Last joint of hind tarsi shorter than the third, or no longer................ 62

Last joint of hind tarsi somewhat longer than the third. (564) *Campoporus* Förster.

62. Clypeus *with* a transverse furrow at apex; metanotum without median carinæ; hind legs long, their tarsi thickened, the longer spur of the tibiæ longer than half the length of the basal tarsal joint; antennæ more than 30-jointed ....(565) *Syntactus* Förster.

Clypeus normal, *without* a transverse furrow at apex; metanotum with two median, parallel, or nearly, carinæ; longer spur of hind tibiæ *not* or rarely half the length of the basal tarsal joint; antennæ 26-jointed, more in male..................(566) *Calliphrurus* Förster.

63. Clypeus at apex *not* bidentate.. 64

Clypeus at apex bidentate................................(567) *Boëthus* Förster.

64. Abdomen laterally *not* or very weakly compressed 65

Abdomen laterally strongly compressed..................(568) *Saotis* Förster.

65. Stigma *not* longer than the marginal cell, usually shorter and triangular, or nearly 66

Stigma much lengthened and acuminate, longer than the marginal cell. (569) *Tromopœa* Förster.

66. Areolet entirely wanting 67

Areolet more or less present, but always open behind.

Metanotum areolated; clypeus much impressed on both sides at apex. (570) *Atithasus* Förster.

Metanotum *not* areolated; clypeus *without* impressions on anterior margin, *not* separated..............................(571) *Hybristes* Förster.

67. Mandibles at apex bidentate 68

Mandibles at apex edentate..........................(572) *Exacrodus* Förster.

68. Lower tooth of the mandibles as long as the upper........................ 69

Lower tooth of the mandibles longer than the upper.

Clypeus *with* a transverse impression before apex; longer spur of hind tibiæ longer than half the length of the basal tarsal joint. (573) *Tachyporthus* Förster.

Clypeus with a transverse impression before apex, the anterior margin not at all interrupted; longer spur of hind tibiæ not half as long as the basal tarsal joint ....(574) *Hyperallus* Förster.

69. Last joint of hind tarsi as long or longer than the third, or scarcely perceptibly shorter 70

Last joint of hind tarsi shorter than the third.................................... 71

70. Abdominal segments 3 and 4 narrower at apex than at base. (575) *Hyperbatus* Förster.

Abdominal segments 3 and 4 fully as wide at apex as at base.

Clypeus *with* a transverse impression before apex; hind tarsi a little longer than the tibiæ.......................... (576) *Scoparches* Förster.

Clypeus *without* a transverse impression before apex; hind tarsi somewhat shorter than the tibiæ ....(577) *Gemophaga* Förster.

71. Base of third discoidal cell as long or longer than the transverse median nervure.. 72

Base of third discoidal cell shorter than the transverse median nervure.

Second recurrent nervure uniting with the cubitus behind the transverse cubitus; first abdominal segment near the spiracles *without* long, deeply foveated furrows ....(578) *Allocritus* Förster.

Second recurrent nervure almost interstitial; first abdominal segment near the spiracles *with* long, deeply foveated furrows. (579) *Enæcetis* Förster.

72. Malar space longer than the width of the mandibles at base; longer spur of hind tibiæ scarcely more than one-third the length of the basal joint of tarsi ....(580) *Synodites* Förster.

Malar space not longer than the width of the mandibles at base.

First three abdominal segments *not* rugulose............................ 74

First three abdominal segments rugulose.

Segments 1 and 2 *without* a transverse impression.................. 73

Segments 1 and 2 *with* a transverse impression...(581) *Spudæa* Förster.

73. Transverse median nervure in the hind wings broken *at* the middle; metathorax *with* the petiolar area normal *without* a middle carina; clypeus anteriorly, on both sides, very deeply impressed; second abdominal segment *without* distinct carinæ near the thyridia; dorsal carinæ of first segment obliterated at base..........(582) *Rhinotorus* Förster.

Transverse median nervure in hind wings broken a little *below* the middle; metathorax with the petiolar area *with* a sharp median carina; second abdominal segment *with* a distinct shortened carina near thyridia; sole of tarsi clothed with long hairs; dorsal carinæ of first segment, especially basally, very prominent. .....(583) *Camponastes* Förster.

74. First abdominal segment at apex *not* more than twice as wide as at base.... 75

First abdominal segment at apex more than twice as wide as at base.

Clypeus posteriorly at base *not* flattened; transverse cubital nervure and the second recurrent nervure almost interstitial. (584) *Tautozelus* Förster.

Clypeus posteriorly at base flattened ....(585) *Hypamblys* Förster.

75. Clypeus anteriorly *with* a slight transverse impression before apex, the anterior margin interrupted and fringed with strong erect hairs. (586) *Phæstus* Förster.

Clypeus *not* fringed with erect bristles on the anterior margin.

Sutures between abdominal segments 1 and 2 *not* deep; clypeus with the anterior margins *not* deeply impressed on both sides........... 76

Sutures between segments 1 and 2, as well as between segments 2 and 3, deep; clypeus with the anterior margin very deeply impressed on both sides..............................(587) *Phagesorus* Förster.

76. Mesonotum scutellum and first three abdominal segments more or less cariaceous 77

Mesonotum, scutellum, and first three abdominal segments not coriaceous. (588) *Sarcorychus* Förster.

77. Occipital margin interrupted medially....................(589) *Apystus* Förster.
Occipital margin *not* interrupted medially.
First abdominal segment *with* carinæ extending from the spiracles to the apex 78
First abdominal segment *without* carinæ extending from the spiracles to the apex....................................(590) *Dolioctonus* Förster.

78. Metanotum *with* more or less distinct carinæ................................ 79
Metanotum *without* trace of carinæ; antennæ ringed with white. (591) *Barytarbes* Förster.

79. Basal joint of hind tarsi *not* thickened; longer spur of hind tibiæ fully half as long as the basal tarsal joint.................................... 80
Basal joint of hind tarsi somewhat thickened; longer spur of hind tibiæ *not* half as long as the basal tarsal joint......(592) *Holmgrenia* Förster.

80. Mesonotum dull, finely shagreened 81
Mesonotum not shagreened..........................(593) *Lathrophagus* Förster.

81. Clypeus with the anterior margin laterally more or less impressed, and more or less distinctly interrupted ....(594) *Campodorus* Förster.
Clypeus with the anterior margin laterally more or less distinctly transversely impressed, the front margin distinctly separated and more or less deeply emarginated.....................(595) *Mesoleius* Holmgren.

Tribe V. BASSINI.

1855. *Tryphonides schizodonti* HOLMGREN, Svensk. Vet.-Akad. Handl., I, p. 98; II, 1856, p. 353.
1868. *Bassoidæ*, Family 14, FÖRSTER, Verh. d. naturh. Ver. pr. Rheinl., XXV, pp. 142 and 162.
1890. *Bassina*, Tribus, THOMSON, Opus. Ent., XIV, p. 1463.
1894. *Bassini*, Tribe V, ASHMEAD, Proc. Ent. Soc. Wash., III, p. 277.
1895. *Bassini*, Tribe, DAVIS, Trans. Am. Ent. Soc., XXII, p. 17.
1900. *Bassini*, Tribe V, ASHMEAD, Smith's Insects of New Jersey, p. 579.

This group, with its sessile abdomen and in having two distinct apical spurs on the middle and hind tibiæ, as well as in venational characters, agrees with the *Ctenopelmini* and the *Tryphonini*, but from these tribes, as well as all the other tribes, it is at once distinguished by the mandibles, which are always *tridentate* at apex, never bidentate.

The species belonging to the group, whose parasitism is known, so far as authentic records go, seem to confine their attacks to the larvæ and puparia of Dipterous insects, and almost without exception to those in the family *Syrphidæ*.

The tribe is of small extent, only ten genera being known, but some of the species, and especially those in the typical genus *Bassus*, have a world-wide distribution. *Bassus lætatorius* Fabricius has been taken in Europe, Africa, Asia, Australia, New Zealand, Chatham Islands, Hawaii, Japan, the West Indies, and in North and South America.

All that is essential for distinguishing the genera may be found in the following table:

TABLE OF GENERA.

Basal abdominal segment *without* a transverse impression 2

Basal abdominal segment *with* a transverse impression.

Front wings *without* an areolet; metathorax short, with an apical transverse carina and a basal area, the spiracles small, round; transverse median nervure in hind wings broken below the middle.
(596) *Bassus* Gravenhorst.

2. Front wings *with* an areolet 5

Front wings *without* an areolet.

Face finely shagreened, alutaceous or coriaceous 4

Face entirely smooth, shining.

Antennæ 20-jointed or *less* 3

Antennæ more than 20-jointed.

Clypeus separated from the face; metathorax areolated; transverse median nervure in hind wings broken *at* or near the middle.
(597) *Promethes* Förster.

3. Clypeus very broad, the foveæ of same wider from each other than the distance to the eye margin .... (598) *Bioblapsis* Förster.
(= *Trichomastix* Vollenhoven.)

Clypeus *not* very broad, the foveæ of same *not* wider from each other than the distance to the eye margin .... (599) *Liopsis* Förster.

4. Metathorax *not* short, more or less areolated, the areola and the basal area usually confluent; first recurrent nervure, or the disco-cubital nervure, strongly curved, *not* angularly broken; transverse median nervure in hind wings broken at about the basal third.
(600) *Zootrephes* Förster.

Metathorax short, exareolated; disco-cubital nervure angularly broken and usually with a stump of a vein present; transverse median nervure in hind wings very obtusely angularly broken below the middle .... (601) *Syrphoctonus* Förster.

5. Metathorax *not* at all areolated 6

Metathorax more or less areolated, or at least with a basal median area.

Metanotum rather long with two parallel longitudinal carinæ, the space between narrow, the areola and the basal area usually confluent; basal joint of hind tarsi elongate, the longer spur of the hind tibiæ short, not nearly half the length of the basal joint.
(602) *Phthorima* Förster.

Metanotum shorter, the areola broad, hexagonal; longer spur of hind tibiæ fully half the length of the basal joint of tarsi.
(603) *Aniarophron* Förster.

6. Second abdominal segment *with* two short median carinæ at base, the dorsal carinæ of the first segment strongly convergent posteriorly, the ventral cavity of same notched; hind legs elongate; disco-cubital nervure angularly bent near the middle, the transverse median nervure *not* interstitial, the submedian cell longer than the median .... (604) *Enizemum* Förster.

Second abdominal segment *without* middle carinæ at base, the first *without* carinæ, or if present very short and widely separated, the ventral cavity of same *not* notched; transverse median nervure *interstitial*, or very nearly, with the basal nervure.
(605) *Homotropus* Förster.

Tribe VI. ORTHOCENTRINI.

1856. *Tryphonides prosopi* Holmgren (part), Kongl. Svensk. Acad. Handl., I, p. 98; II, 1856, pp. 305–352.
1868. *Orthocentroidæ*, Family 11, Förster, Verh. d. naturh. Ver. pr. Rheinl., XXV, pp. 142 and 159.
1894. *Orthocentrini*, Tribe VII, Ashmead, Proc. Ent. Soc. Wash., III, p. 277.
1897. *Orthocentrini*, Tribe, Davis, Trans. Am. Ent. Soc. XXIV, p. 219.

This tribe and the next, or the *Exochini*, at one time confounded together, are closely allied, both being composed of a number of minute or moderate sized insects, easily distinguished from all the other tribes by cephalic peculiarities and their stout, rather short legs, their femora being much swollen.

The head is subglobose, with the face, below the insertion of the antennæ, abnormally swollen, or highly or convexly elevated, giving these insects, when viewed from the side, quite a different aspect to all other Tryphonines, and which, in connection with their short legs and swollen femora, renders them easy of recognition.

The *Orthocentrini* are separated from the *Exochini* by the long scape or first joint of the antennæ, which is never short, or globose, as in the latter.

Förster's generic separation is as follows:

TABLE OF GENERA.

Ovipositor *not* projecting beyond the tip of the abdomen 3
Ovipositor projecting beyond the tip of the abdomen 2
2. Wings *without* an areolet .... (606) *Synoplus* Förster.
Wings *with* an areolet.
First joint of the flagellum shorter than the second. (607) *Mnesidacus* Förster.
First joint of the flagellum as long as the second. (608) *Picrostigeus* Förster.
3. Metanotum *without* a complete areola; mesopleura *without* a ridge or rim on the front margin 4
Metanotum *with* an areola; mesopleura *with* a ridge or rim on the front margin. 6
4. Petiolar area without a median carina, the metanotum not at all areolated... 5
Petiolar area with a median carina .... (609) *Brephoctonus* Förster.
5. Cheeks *not* separated from the face by a furrow; metanotum *without* trace of carinæ .... (610) *Hypoleptus* Förster.
Cheeks separated from the face by a furrow; metanotum *with* or *without* a carina.
Metanotum *without* a trace of a carina; abdomen with the third segment usually the longest, and in female compressed from the second segment, as in a blade of a knife .... (611) *Neuroteles* Ratzeburg.
Metanotum *with* a single carina; abdomen with the third segment not longer than the second, and in female more or less compressed from the second or third segment; in male, flat .... (612) *Deleter* Förster.
6. Wings *without* an areolet, rarely appearing as if closed by a slender hyaline line 8
Wings *with* an areolet.
Face very high; mesothoracic furrows absent 7

Face much broader than high, humped; mesothoracic furrows distinct to the middle of the mesonotum..................... (613) *Tapinops* Förster.

7. Flagellar joints in female usually wider than long, rarely as long as wide; third abdominal segment *with* a transverse impression before the middle. (614) *Atmetus* Förster.

Flagellar joints all, or at least many, longer than wide; third abdominal segment *without* a transverse impression...(615) *Orthocentrus* Gravenhorst.

8. Mesopleura separated from the mesopectus by an abbreviated furrow; second abdominal segment *with* distinct *lunulæ;* stigma in male large, squarely truncate at apex; sheaths of ovipositor in female broad; the abscissa of the cubitus which lies between the cubital and discoidal cross veins fully three-fourths the length of the first abscissa of the radius. (616) *Phænosemus* Förster.

Mesopleura *not* separated from the mesopectus by a furrow; second abdominal segment *without lunulæ;* stigma in male normal; sheaths of ovipositor in female narrow; the abscissa of the cubitus which lies between the cubital and discoidal cross veins scarcely half the length of the first abscissa of the radius.

Stigma narrow and long, the radius originating near its base. (617) *Stenomacrus* Förster.

Stigma somewhat broad, the radius originating from the middle. (618) *Camarotops* Förster.

Tribe VII. EXOCHINI.

1855. *Tryphonides prosopi* HOLMGREN, Kongl. Svensk. Vet.-Akad. Handl., I, p. 98; II, 1856, pp. 305–352.

1868. *Exochoidæ*, Family 12 FÖRSTER, Verh. d. naturh. Ver. pr. Rheinl., XXV, pp. 142 and 161.

1894. *Exochini*, Tribe VI, ASHMEAD, Proc. Ent. Soc. Wash., III, p. 277.

1897. *Exochini*, Tribe DAVIS, Trans. Am. Ent. Soc., XXIV, p. 206.

1900. *Exochini*, Tribe VI, ASHMEAD, Smith's Insects of New Jersey, p. 379.

The nearest allies of this tribe are the *Orthocentrini* and the *Tylecomnini;* from the former it is separated by the short globose scape, from the latter by the swollen face.

Mr. Davis[1] attempts to retain Cresson's genus *Exochoides* for a species to which I gave the name *Ischyrocnemis carolina.*

Mr. Cresson's genus is clearly a synonym of *Alcocerus* Förster, and as originally described by him included only three species from Mexico, *without* an areolet in the front wings. *Exochoides texanus*, with an areolet, was not described until long afterwards, and can not now be considered the type of that genus. It was not one of the original species, and is here made a type of a new genus.

Twelve genera have been recognized, separable as follows:

TABLE OF GENERA.

Abdomen sessile or subsessile, the spiracles of first segment placed at or before the middle 4

Abdomen petiolate; the spiracles of first segment placed at or behind the middle.

Posterior tibiæ with 2 apical spurs; cheeks wanting or very short............. 2

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[1] Trans. Am. Ent. Soc., XXIV, p. 206.

Posterior tibiæ with 1 apical spur; cheeks long; metathorax areolated; transverse median nervure in hind wings *not* broken.
(619) *Periope* Curtis = *Monoplectron* Holmgren = *Oligoplectron* Förster.

2. Wings *without* an areolet.. 3
Wings *with* an areolet.
Transverse median nervure in hind wings; metathorax punctate, areolated and *with* lateral carinæ.................(620) *Ischyrocnemis* Holmgren.
(Type, *Ischyrocnemis goësi* Holmgren.)
Transverse median nervure in hind wings angularly broken a little above the middle; metathorax smooth, exareolated, *without* lateral carinæ.
(621) *Ischyrocnemopsis* Ashmead, new genus.
(Type, *Exochoides texanus* Cresson.)

3. Transverse median nervure in hind wings broken *below* the middle; metathorax smooth, exareolated; second flagellar joint in male shorter than the first.
(622) *Alcocerus* Förster = *Exochoides* Cresson.

4. Metanotum *with* areas at base; or with longitudinal carinæ................. 5
Metanotum *without* areas at base; the lateral carinæ present.
Wings *without* an areolet; the transverse median nervure in hind wings broken below the middle................(623) *Colpotrochia* Holmgren.
Wings *with* a pentagonal areolet................(624) *Strongylopsis* Brauns.

5. First joint of flagellum distinctly longer than the second 6
First joint of flagellum *not* or scarcely longer than the second.
Metanotum with six areas ....(625) *Hyperacmus* Holmgren.

6. Second abdominal segment *without* a middle carina......................... 7
Second abdominal segment *with* a middle carina ...(626) *Chorinæus* Holmgren.

7. Metanotum with the basal lateral area separated from the area dentipara by a sharp carina 8
Metanotum with the basal lateral area and the area dentipara *confluent*.
Wings *with* an areolet; metanotum with the basal and middle lateral areas wholly confluent; transverse median nervure in hind wings broken at basal third ....(627) *Triclistus* Förster.
Wings *without* an areolet; metanotum with the basal and middle lateral areas more or less separated by a transverse carina; transverse median nervure in hind wings broken at basal fifth...(628) *Amesolytus* Förster.

8. Vertex *not* separated from the occiput by a sharp carina..................... 9
Vertex separated from the occiput by a sharp carina.
Front wings with an areolet; metanotum with five areas.
(629) *Metacœlus* Förster.

9. Metanotum with three middle areas....(630) *Polyclistus* Förster = *Mima* Davis.
Metanotum with six areas and two middle areas...(631) *Exochus* Gravenhorst.

Tribe VIII. TYLECOMNINI.

1868. *Trachydermatoidæ*, Family 13, Förster, Verh. d. naturh. Ver. pr. Rheinl., XXV, pp. 142 and 161.
1894. *Trachydermatini*, Tribe VI, Ashmead, Proc. Ent. Soc. Wash., III, p. 277.
1897. *Metopiini*, Tribe (part), Davis, Trans. Am. Ent. Soc., XXIV, p. 197.

This tribe was first separated by Förster under the name *Trachydermatoidæ;* while Davis has included it with the *Metopiini*.

Davis has made several serious blunders in his translations from Förster, and in some cases his tables are totally wrong. His *Trachy-*

dermatini[1] has nothing to do with this tribe, but refers to Förster's family *Trachynotoidæ*, treated in this paper as a tribe under the name *Nototrychini*, in the subfamily *Ophioninæ*.

The tribe *Tylecomnini* is intermediate between the *Exochini* and *Sphinctini*, but is easily distinguished by the characters made use of in my table of tribes.

Only five genera are known, four being peculiar to North America and one to Europe, separable as follows:

TABLE OF GENERA.

Eyes normal, *not* emarginate 2
Eyes emarginate.
  Abdominal segments 1–3 *with* parallel dorsal carinæ; scutellum margined at sides .... (632) *Pseudometopius* Davis.
2. Face transverse, the clypeus more or less separated 3
  Face elongate, the clypeus *not* separated.
  (633) *Tylecomnus* Holmgren = *Trachyderma* Gravenhorst.
3. Claws pectinate 4
  Claws *not* pectinate.
    Scutellum depressed; abdominal segments constricted at base; head with a spine between the antennæ .... (634) *Thibetoides* Davis.
    Scutellum elevated; abdominal segments and the head normal.
    (635) *Lethades* Davis.
4. Scutellum elevated; abdominal segments 2–4 constricted at base; clypeus large, prominent .... (636) *Calocentrus* Walsh.

Tribe IX. SPHINCTINI.

1868. *Sphinctoidæ*, Family 19, Förster, Verh. d. naturh. Ver. pr. Rheinl., XXV, 1868, pp. 143 and 170.
1894. *Sphinctini*, Tribe IX, Ashmead, Proc. Ent. Soc. Wash., III, p. 277.

This tribe is represented by a single genus *Sphinctus* Gravenhorst.

It comes nearest to the tribe *Tylecomnini*, so far as the characters of the legs and the venation of the front wings are concerned, but it is readily distinguished by the distinctly petiolated abdomen, the abdomen being long and narrowed into a distinct petiole anteriorly, the spiracles of same being prominent and placed *behind* the middle.

These characters, with the following, render the genus easy of recognition:

Submedian cell in front wings longer than the median, the areolet triangular, subsessile; transverse median nervure in the hind wings broken at or very near the middle; abdomen petiolate, rather strongly punctate.
(637) *Sphinctus* Gravenhorst.

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[1] Trans. Am. Ent. Soc. XXIV, 1897, p. 195.

Tribe X. METOPIINI.

1856. *Tryphonides aspidopi* HOLMGREN, Kongl. Svensk. Akad. Handl., I, pp. 372–374.
1868. *Metopioidæ*, Family 10, FÖRSTER, Verh. d. naturh. Ver. pr. Rheinl., XXV, pp. 142 and 159.
1894. *Metopiini*, Tribe X, ASHMEAD, Proc. Ent. Soc. Wash., III, p. 277.
1897. *Metopiini*, Tribe, DAVIS (part) Trans. Am. Ent. Soc., XXIV, p. 197.
1900. *Metopiini*, Tribe X, ASHMEAD, Smith's Insects of New Jersey, p. 579.

This is a peculiar and interesting group, quite distinct from all the other tribes in several particulars.

It was first separated from other Tryphonids by Holmgren, who gave to it the name *Tryphonides aspidopi*. The tibial spurs are 1, 1, 1; the abdomen is elongate, the sides parallel or nearly, the segments coarsely punctate, the areolet large, lozengoidal, or diamond-shaped, the scutellum quadrangular, margined laterally, while the face is flat, scutiform, with sometimes a carina on its disk.

These characters render the group easily recognized.

Only two genera are known, one, *Cultrarius* Davis, being peculiar to North America; the other, *Metopius* Panzer, having a world-wide distribution.

TABLE OF GENERA.

Face flat, scutiform.

Head small, much narrower than the thorax; antennæ subclavate; abdomen fusiform, tapering off at apex; second joint of palpi normal; transverse median nervure in hind wings angularly broken *above* the middle. (638) *Cultrarius* Davis

Head not small, as wide, or nearly, as the thorax; antennæ filiform; abdomen elongate, the sides parallel or nearly; second joint of palpi abnormally swollen .... (639) *Metopius* Panzer

Subfamily V. OPHIONINÆ.

1858. *Ophionida* HOLMGREN, Öfvers. Vets.-Akad. Förhl., XV, pp. 331–330.
1887. *Ophionidæ*, Familia, THOMSON, Opus. Ent., XI, p. 1047.
1887. *Ophioninæ*, Subfamily, CRESSON, Syn. Hym. North America, p. 43.
1900. *Ophioninæ*, Subfamily V, ASHMEAD, Smith's Insects of New Jersey, p. 580.

Most authorities on these insects have recognized this major group as distinct from other *Ichneumonidæ*, and as early as 1846, August Brullé called it: Deuxiéme type des Ichneumonides—Les Ophion.

Brullé, however, never properly defined it and had evidently very hazy ideas respecting it, since he incorrectly included in it the genus *Osprynchotus* Spinola, a genuine Cryptine, and two or three other genera belonging elsewhere.

Only typical forms appear to be readily placed, and the closest attention must be given to abdominal, metathoracic and certain venational differences before others can be placed with any degree of certainty; and even then, if one is not familiar with a large number of the genera in the different tribes, he is apt to go astray. Most females, however, except certain forms at present placed in the tribe *Plectiscini*, seem to be easily placed, while many males belonging to several of the tribes are easily confused with those in different groups.

The true position of the tribe *Plectiscini*, which as at present constituted is evidently an unnatural group, is still doubtful. It has affinities allying it with the *Tryphoninæ*, *Cryptinæ*, and other of the subfamilies.

The subfamily may be divided into twelve groups or tribes, as follows:

TABLE OF TRIBES.

Second recurrent nervure joining the cubitus *behind* the transverse cubitus or interstitial with it; middle tibiæ always with *two* apical spurs 3

Second recurrent nervure joining the cubitus *before* the transverse cubitus, or it is entirely wanting (*Pharsalia* Cresson); if it joins the cubitus *behind* the transverse cubitus then the middle tibiæ have but a *single* apical spur 2

2. Middle tibiæ with *two* apical spurs; second recurrent nervure joining the cubitus *before* the transverse median nervure.

Antennæ short, clavate; mesosternum beneath flat; mesonotum *without* parapsidal furrows; metathorax areolated.

Tribe I. HELLWIGIINI.

Antennæ long, subsetaceous; mesosternum beneath not flat, declivous before the middle coxæ; mesonotum usually with distinct parapsidal furrows; metathorax rarely distinctly areolated, usually *without* areas or at most with one or more transverse carinæ.

Tribe II. OPHIONINI.

Middle tibiæ with only *one* apical spur; second recurrent nervure joining the cubitus *behind* the transverse cubitus or entirely wanting.

Tribe III. NOTOTRACHINI.

3. Front wings with the stigma large, broadly triangular or broadly ovate; metathorax not produced into a neck at apex 6

Front wings with the stigma long and narrow, most frequently lanceolate, rarely broad or broadly triangular, although frequently subovate 4

4. Metathorax at apex truncate or rounded, but never produced into a neck which extends beyond the insertion of the hind coxæ 5

Metathorax at apex produced into a more or less distinct neck which extends beyond the insertion of the hind coxæ; abdomen frequently strongly compressed or compressed toward apex, petiolate, the petiole long, the spiracles placed much behind the middle.

Mesonotum most frequently *with* distinct parapsidal furrows although sometimes without, or only delicately impressed, wanting anteriorly; areolet most frequently wanting; abdomen always long, strongly compressed with the petiole only slightly and gradually thickened posteriorly, never abruptly swollen at apex; hind tarsi usually more or less distinctly thickened, especially in males.

Tribe IV. ANOMALINI.

Mesonotum *without* parapsidal furrows; areolet often present, sometimes wanting; abdomen as a rule shorter and less strongly compressed, more fusiformly compressed; the petiole somewhat abruptly, con-

vexly swollen at apex, or at least not gradually thickened posteriorly; hind tarsi normal, very rarely thickened.
Tribe V. CAMPOPLEGINI.

5. Spiracles of first abdominal segment placed *before* the middle; transverse median nervure in hind wings broken *above* the middle, rarely *at* or *below* the middle; abdomen in males not ending in two spines, the claspers often large, broad.

Abdomen petiolate, rarely subsessile; areolet in front wings triangular, or oblique rhomboidal, the second abscissa of the radius most frequently strongly curved at its origin and forming with the first abscissa an acute angle (very straight and forming an obtuse angle); transverse median nervure in hind wings broken most frequently *above* the middle, rarely at or below the middle; thorax shining, most frequently impunctate; parapsidal furrows present, but delicate; ovipositor exserted.................... Tribe VI. PANISCINI.

Abdomen sessile or subsessile; areolet in front wings, when present, rather large, rhomboidal, the second abscissa of radius straight, rarely slightly curved at its origin, and forming with the first an obtuse angle; transverse median nervure in hind wings broken *far above* the middle, very near the apex; thorax usually opaque or punctate, rarely smooth and shining; parapsidal furrows wanting or only slightly and vaguely defined anteriorly; ovipositor usually short, or not at all exserted .... Tribe VII. BANCHINI.

Spiracles of first abdominal segment placed *at* or a little *beyond* the middle; transverse median nervure in hind wings straight, or broken *below* the middle; abdomen in males ending in two long spines; abdomen petiolate, polished, the ovipositor distinctly exserted, but never very long; areolet in front wings rather large, rhomboidal.
Tribe VIII. MESOCHORINI.

6. Middle vein in hind wings wanting or obliterated toward base; basal nervure distinctly thickened at apex or where it unites with the costa or parastigma .... Tribe IX. PORIZONINI.

Middle vein in hind wings distinct, *not* obliterated toward the base.

Hind femora beneath armed with a strong tooth beyond the middle.
Tribe X. PRISTOMERINI.

Hind femora beneath simple, unarmed.

Head not small; clypeus neither convex nor compressed from the sides; hind tibiæ normal, *not* constricted at the base.
Tribe XI. CREMASTINI.

Head usually small; clypeus convex and usually compressed from the sides; hind tibiæ thickened and usually more or less constricted at base.
Tribe XII. PLECTISCINI.

Tribe I. HELLWIGIINI.

1868. *Hellwigioidæ*, Family 6, FÖRSTER, Verh. d. naturh. Ver. pr. Rheinl., XXV, pp. 141 and 149.
1887. *Helwigiina*, Tribus, THOMSON, Opus. Ent., XI, p. 1048.
1894. *Hellwigiini*, Tribe VI, ASHMEAD, Proc. Ent. Soc. Wash., III, p. 277.

The essential characters for the ready recognition of this tribe have been brought out prominently in my table of tribes and need not be repeated here, the short clavate antennæ being found in no other tribe.

The group is of small extent and is represented by a single genus not yet found outside of the European fauna.

Antennæ short clavate; metanotum areolated ....(640) *Hellwigia* Gravenhorst.

Tribe II. OPHIONINI.

1868. *Ophionoidæ*, Family 7, FÖRSTER, Verh. d. naturh. Ver. pr. Rheinl., XXV, pp. 141 and 149.
1887. *Ophionina*, Tribus, THOMSON, Opus. Ent., XI, p. 1048.
1894. *Ophionini*, Tribe VII, ASHMEAD, Proc. Ent. Soc. Wash., III, p. 277.
1900. *Ophionini*, Tribe II, ASHMEAD, Smith's Insects of New Jersey, p. 580.

To this tribe belong the genuine Ophiones—insects belonging to the genus *Ophion* and allies—distinguished from all the others, except those in the tribe *Hellwigiini*, by having the second recurrent nervure uniting with the cubitus *before* the first transverse cubitus.

The true *Ophionini* are, however, readily separated from the *Hellwigiini* by their long, filiform, or setaceous antennæ and by the flat mesosternum.

Twelve genera have been recognized, distinguishable as follows:

TABLE OF GENERA.

Front wings without an areolet.
  Face normal, unarmed 2
  Face armed with a tooth.
  Disco-cubital nervure not angularly broken; transverse median nervure in hind wings angularly broken at the middle; abdomen petiolate.
    (641) *Gravenhorstia* Boie = *Odontopsis* Förster.
2. Disco-cubital nervure usually angularly broken *with* a stump of a vein or a trace of such a vein 3
  Disco-cubital nervure *not* angularly broken, straight or bent, *without* a trace of a stump of a vein 4
3. Second abdominal segment with the spiracles placed at the middle; metanotum *not* completely areolated, usually with one or two transverse carinæ; claws pectinate.
    Labium abnormally lengthened 12
    Labium normal, not lengthened.
      Transverse median nervure in front wings interstitial, or nearly, with the basal nervure, in the hind wings obtusely angularly broken *at* or *near* the middle; first abcissa of radius normal, *not* swollen at base ....(642) *Ophion* Gravenhorst.
      Transverse median nervure in front wings *not* interstitial with the basal nervure, originating a little before it, in hind wings broken *below* the middle at the basal third, or at least far below the middle; first abcissa of radius thickened or swollen towards the base. (Hawaii.)
        (643) *Pleuroneurophion* Ashmead, new genus.
        (Type, *Pleuroneurophion hawaiensis* Ashmead, manuscript.)
4. Transverse cubital nervure straight, in a pointed angle with the cubitus, the latter originating from the apex of the disco-cubital cell.
    Claws pectinate 5
    Claws simple, *not* pectinate 11

5. Disco-cubital cell *with* one or more dark-colored blisters.................. 10
Disco-cubital cell normal, *without* dark-colored blisters.
Transverse median nervure in hind wings broken *above* the middle...... 6
Transverse median nervure in hind wings broken *at* or *above* the middle . 7

6. Clypeus anteriorly subangularly pointed; median and submedian cells in front wings equal; ocelli not large, separated from each other and the eyes; eyes not extending clearly to the base of the mandibles, always with a space between..............(644) *Thyreodon* Brullé.
Clypeus anteriorly *not* subangularly pointed; median cell longer than the submedian; ocelli large, touching each other or very close and also close to the eye margin; eyes very large, extending clear to the mandibles and emarginate within, opposite the antennæ.
(645) *Athyreodon* Ashmead, new genus.
(Tpye, *Athyreodon thoracicus* Ashmead, manuscript.)

7. Clypeus truncate, or very slightly rounded anteriorly.
Submedian cell as long or a little longer than the median, rarely a little shorter; first recurrent nervure *not* interstitial, originating *before* the discoidal nervure; metathorax with one or two transverse carinæ. 9
Submedian cell a little shorter than the median; first recurrent nervure interstitial or very nearly with the discoidal or second transverse median nervure; metathorax short, with a transverse carina near base, the posterior face rugulose, smooth or coriaceous........... 8

8. Abdomen longer than the head and thorax united, but never twice as long.
Disco-cubital nervure originating from, or *interstitial* with, the discoidal nervure; transverse median nervure in hind wings broken at a right angle much *below* the middle; abdomen subcompressed, fusiform, the ovipositor very short, *not* projecting beyond the tip of the abdomen; posterior face of metathorax rugose. (Hawaii.)
(646) *Banchogastra* Ashmead, new genus.
(Type, *Banchogastra nigra* Ashmead, manuscript.)
Disco-cubital nervure originating a little *before* the discoidal nervure, never interstitial with it; transverse median nervure in hind wings obtusely angularly broken at or near the middle; abdomen strongly compressed, the ovipositor as long or nearly as long as the abdomen; posterior face of metathorax smooth or nearly. (Hawaii.)
(647) *Pycnophion* Ashmead, new genus.
(Type, *Pycnophion molokaiensis* Ashmead, manuscript.)

9. Abdomen fully twice as long as the head and thorax united or even still longer.
(648) *Eremotylus* Förster.

10. Transverse median nervure in hind wings broken far *below* the middle.
(649) *Enicospilus* Curtis.

11. Transverse median nervure in hind wings straight, *not* broken; metanotum *with* two basal areas........................ (650) *Ophionopterus* Brullé.
Transverse median nervure in hind wings broken near the middle; metanotum *without* areas ....(651) *Retanisia* Cameron.

12. Submedian cell a little longer than the median, the transverse median nervure in hind wings broken slightly *above* the middle; head buccate; abdomen rather thick and stout, subcompressed toward apex.
(652) *Agathophiona* Westwood.

Tribe III. NOTOTRACHINI.

1868. *Trachynotoidæ*, Family 2, FÖRSTER, Verh. d. naturh. Ver. pr. Rheinl., XXV, pp. 140 and 147.

1887. *Trachynotina*, Tribus, THOMSON, Opus. Ent., XI, pp. 1048.

1894. *Trachynotini*, Tribe II, Ashmead, Proc. Ent. Soc. Wash., III, p. 277.
1897. *Trachydermatini* Davis, Trans. Am. Ent. Soc., XXIV, p. 195.
1900. *Nototrachini*, Tribe III, Ashmead, Smith's Insects of New Jersey, p. 580.

This group is the only one in the subfamily *Ophioninæ* having but a *single* apical spur to the middle tibiæ, all the others being armed with two spurs. It also contains a genus with only one recurrent nervure—as in the family *Braconidæ*—namely, *Pharsalia* Cresson.

This curious genus is extremely rare and is, without doubt, identical with *Ophionellus* Westwood described from Mexico, and placed in the family *Evaniidæ*.

Only three genera fall into this tribe as follows.

TABLE OF GENERA.

Second recurrent nervure present, distinct 2
Second recurrent nervure wanting.
Metathorax long, sloping off posteriorly and produced into a slight neck beyond the insertion of hind coxæ, coarsely rugose, exareolated, but with a median longitudinal sulcus.......(653) *Pharsalia* Cresson = *Ophionellus* Westwood.
2. Metanotum exareolated; antennæ slender, filiform; second recurrent nervure received *before* the transverse cubital nervure.
(654) *Nototrachys* Marshall = *Trachynotus* Gravenhorst.
Metanotum areolated at base; antennæ somewhat thickened; second recurrent nervure received *behind* the transverse cubital nervure.
(655) *Eugnomus* Förster.

Tribe IV. ANOMALINI.

1868. *Anomaloidæ*, Family 1, Förster, Verh. d. naturh. Ver. pr. Rheinl., XXV, pp. 140 and 145.
1887. *Anomalina* Thomson, Opus. Ent., XI, p. 1048.
1894. *Anomalonini*, Tribe I, Ashmead, Proc. Ent. Soc. Wash., III, p. 277.
1900. *Anomalini*, Tribe IV, Ashmead, Smith's Insects of New Jersey, p. 580.

This tribe, as well as those which are to follow, has two apical spurs on the middle tibiæ and two recurrent nervures in the front wings. The second recurrent nervure joins the cubitus *behind* the first transverse cubitus, or it is at the most interstitial, but never joins the cubitus before the first transverse cubitus.

These characters readily separate this and the following tribes from the *Hellwigiini*, the *Ophionini*, and the *Nototrachini*.

The *Anomalini* are, however, separated from all the other tribes, except the *Campoplegini*, by the metathorax being produced at apex into a distinct neck that extends beyond the insertion of the hind coxæ. From the *Campoplegini* they are separated by the much longer and more strongly compressed abdomen, by the petiole being only slightly and gradually thickened posteriorly, never abruptly swollen, and by the hind tarsi being most frequently, although not always, distinctly incrassated or much thickened, especially in the males.

Sixteen genera fall into this tribe, distinguishable by the aid of the following table:

TABLE OF GENERA.

Front wings *without* an areolet; hind femora beneath normal, unarmed............ 2

Front wings *with* an areolet; hind femora beneath toward apex *armed* with a tooth; abdomen long, strongly compressed.....(656) *Eiphosoma* Cresson.

2. Claws pectinate.. 9

Claws simple, *not* pectinate.

Labrum prominent, more or less projecting............................... 8

Labrum *not* prominent, entirely covered by the clypeus.

Transverse median nervure in hind wings straight, *not* broken...... 3

Transverse median nervure in hind wings distinctly broken 4

3. Disco-cubital nervure interstitial *with* the discoidal nervure, the third discoidal cell therefore pointed at base; second discoidal cell not twice as wide at apex as at base; hind tibiæ lengthened.
(657) *Agrypon* Förster.

Disco-cubital nervure *not* interstitial with the discoidal nervure, the third discoidal cell not pointed at base; second discoidal cell twice as wide at apex as at base, or nearly; hind tibiæ short. (658) *Atrometus* Förster.

4. Second recurrent nervure interstitial or *very nearly*, with the transverse cubitus, the first abscissa of cubitus wanting or very short................ 6

Second recurrent nervure *not* interstitial, the first abscissa of the cubitus distinct 5

5. Discoidal cell at base narrower than the length of the transverse median nervure, or the width of second discoidal cell at base; transverse median nervure in hind wings broken *above* the middle.

Eyes hairy; mesonotal furrows wanting.
(659) *Therium Curtis*=*Trichomma* Wesmael.

Eyes bare; mesonotal furrows distinct..........(660) *Labronychus* Förster.

Discoidal cell at base as wide or wider than the length of the transverse median nervure.

Clypeus anteriorly broadly curved outwardly and rather deeply emarginate so as to appear bilobed; transverse median nervure in hind wings obtusely angularly broken *above* the middle.
(661) *Schizoloma* Wesmael=*Schizopoma* Förster.

Clypeus quite differently formed, not bilobed; transverse median nervure in hind wings broken *at* or a little *below* the middle.
(662) *Anomalon* Gravenhorst.

6. Base of third discoidal cell as wide or wider than the length of the transverse median nervure.. 7

Base of third discoidal cell shorter, *not* so wide as the length of the transverse median nervure.

Clypeus anteriorly produced into a point..........(663) *Laphyctes* Förster.

Clypeus anteriorly rounded, *not* pointed...........(664) *Barylypa* Förster.

7. Submedian cell longer than the median, the transverse median nervure originating *beyond* the basal nervure.

Postscutellum *with* a middle carina; clypeus anteriorly normal, or at most subtriangular; transverse median nervure in hind wings broken at about the middle; metanotum without a middle sulcus.
(665) *Sympratis* Förster.

Postscutellum rugose; clypeus anteriorly triangularly acute.
(666) *Acanthostoma* Kriechbaumer.

Submedian and median cells equal, or very nearly, the transverse median nervure being interstitial or nearly with the basal nervure; postscutellum normal .... (667) *Erigorgus* Förster.

8. Clypeus at apex truncate; basal joint of hind tarsi about twice as long as the second; transverse median nervure in hind wings broken before the middle .... (668) *Exochilum* Wesmael.

Clypeus at apex rounded; basal joint of hind tarsi about four times as long as the second .... (669) *Heteropelma* Wesmael.

9. Frons normal, unarmed 10

Frons medially armed with a sharp ridge, which below becomes more or less cone-shaped; transverse median nervure in hind wings broken *below* the middle .... (670) *Aphanistes* Förster.

10. Scutellum laterally highly and sharply margined; transverse median nervure in hind wings broken *above* the middle, without a stump of a nervure .... (671) *Camposcopus* Förster.

Scutellum laterally *not* highly margined; transverse median nervure in hind wings broken *above* the middle, with a stump of a vein which extends forward toward the margin of the wing. (672) *Habronyx* Förster.

Tribe V. CAMPOPLEGINI.

1868. *Campoplegoidæ*, Family 8, Förster, Verh. d. naturh. Ver. pr. Rheinl., XXV, pp. 141 and 150.

1887. *Campoplegina*, Tribus, Thomson, Opus. Ent., XI, p. 1049.

1894. *Campoplegini*, Tribe VIII, Ashmead, Proc. Ent. Soc. Wash., III, p. 277.

1890. *Campoplegini*, Tribe V, Ashmead, Smith's Insects of New Jersey, p. 581.

The insects falling in this tribe, in metathoracic and venational characteristics, are most closely allied to the *Anomalini*, and many of them are easily confused with those of that tribe, since there is no sharp divisional character known.

The differences noted in the mesonotum (usually the absence of parapsidal furrows), the shorter, less distinctly (rarely strongly) compressed abdomen, the shape of the petiole, and the normally thickened, rarely incrassated, hind tarsi, must therefore be depended upon to separate them.

Sixty-five genera have been recognized in the group, most of which occur in our fauna. At present many of these genera are represented by described species wrongly placed in *Limneria* and allied genera.

The following table will enable the student to recognize most of the genera:

TABLE OF GENERA.

Metathoracic spiracles linear, elliptic or strongly ovate 2

Metathoracic spiracles round or broadly short-oval 5

2. Front wings *with* an areolet 3

Front wings *without* an areolet.

Eyes more or less emarginate within .... (673) *Charops* Holmgren.

3. Abdomen *not* strongly compressed from the sides of the second segment..... 4

Abdomen strongly compressed from the sides of the second segment; areolet large, sessile, or petiolate .... (674) *Campoplex* Gravenhorst.

4. Tibial spars very long, hardly shorter than the first joint of tarsi.
(675) *Echthronomas* Förster.

Tibial spars distinctly shorter that the first joint of tarsi.
(676) *Zachresta* Förster.

5. Clypeus distinctly separated or at least separated by deep-grooved lines at the sides 6

Clypeus *not* at all separated.

Front wings *without* an areolet; eyes subemarginate within; claws armed with stout, stiff bristles .... (677) *Bosmina* Cameron.

Front wings *with* an areolet; eyes normal, not at all emarginate within.
(678) *Amorphota* Förster.

6. Eyes bare 9

Eyes either faintly or distinctly hairy; face in female narrowed anteriorly... 7

7. Wings *with* an areolet 8

Wings *without* an areolet.

Metathorax completely areolated, the areola hexagonal; first abdominal segment striate, smooth only at base; eyes very large, extending to base of mandibles; sheaths of ovipositor thickened medially.
(679) *Thymaris* Förster.

8. Eyes indistinctly hairy; metathorax areolated, the areola and the petiolar area distinctly separated; face narrowed in both sexes; petiole not smooth; ovipositor very short, not extending beyond tip of abdomen.
(680) *Symplecis* Förster.

Eyes distinctly hairy; metathorax *not* areolated, or if areolated the areola and the petiolar area confluent, ovipositor prominent, projecting beyond tip of abdomen.

Metathorax areolated, but with the areola and the petiolar area confluent; transverse median nervure in front wings interstitial with the basal nervure; petiole smooth .... (681) *Cymodusa* Holmgren.

Metathorax *not* areolated; transverse median nervure in front wings originating before the origin of the basal nervure; petiole *not* smooth.
(682) *Olethrodotis* Förster.

9. Clypeus anteriorly truncate or slightly rounded, *never* pointed or lengthened, *without* a median tooth 10

Clypeus anteriorly pointed or lengthened, *with* a median tooth; areolet distinctly petiolated; transverse median nervure in hind wings *not* distinctly broken; metathoracic spiracles short oval.
(683) *Sagarites* Holmgren.

10. Abdomen not much compressed, but gradually fusiformly thickened toward apex 16

Abdomen, especially toward apex, much compressed, *not* fusiformly thickened.

Areolet entirely wanting 15

Areolet present 11

11. Abdomen strongly compressed, entirely smooth, the sutures of the segments very fine; female .... (684) *Angitia* Holmgren.

Abdomen not entirely smooth, the sutures of the segments distinct.

Metathorax exareolate or with the areola *not* completely closed by carinæ, open behind 12

Metathorax areolated, or with the areola completely closed by carinæ.

Claws simple .... (685) *Rhythmonotus* Förster.

Claws pectinate .... (686) *Trathala* Cameron.

12. Transverse median nervure in hind wings *not* broken, or broken *below* the middle 13

Transverse median nervure in hind wings broken *at* or *above* the middle; areolet petiolate; transverse median nervure in front wings interstitial with the basal nervure; inner spur of hind tibiæ very long.
(687) *Casinaria* Holmgren.

13. Disco-cubital nervure *not* angularly broken, *without* a stump of a vein...... 14

Disco-cubital nervure angularly broken, *with* a stump of a vein.

Metanotum broadly longitudinally impressed, the areola and petiolar area confluent........................ (688) *Campotrephus* Förster.

14. Joints 4 and 5 of hind tarsi of an *equal* length; claws pectinate; metathorax long, sloping from base of scutellum and produced much beyond the insertion of hind coxæ; abdomen very long.
(689) *Horogenes* Förster.

Joints 4 and 5 of hind tarsi of an *unequal* length.

Metathorax *without* carinæ; longer spur of hind tibiæ in female nearly as long as the basal joint of their tarsi......... (690) *Alcima* Förster.

Metathorax short, *with* delicate carinæ; longer spur of hind tibiæ about one-third shorter than the basal joint; claws with strong teeth at base.
(691) *Hyposoter* Förster.

15. Metathorax exareolated; abdomen very elongate......(692) *Podogaster* Brullé.

16. Malar furrow *not* deep, wanting or very indistinct......................... 17

Malar furrow deep, distinct..................... (693) *Gnathochorisis* Förster.

17. Front wings *with* an areolet.. 23

Front wings *without* an areolet.

Basal joint of hind tarsi more than one-third the length of tibiæ and *not* distinctly thicker than the following joints.................. 18

Basal joint of hind tarsi not more than one-third the length of tibiæ and distinctly thicker than the following joints.
(694) *Eripternus* Förster.

18. Metathorax with the areola *closed* anteriorly............................. 19

Metathorax with the areola *open* anteriorly.............(695) *Nepiesta* Förster.

19. Head quadrate or cubical.. 20

Head transverse, not cubical.

Claws toothed.................................(696) *Zaporus* Förster.

20. Transverse median nervure in the hind wings *not* broken................. 21

Transverse median nervure in the hind wings broken.

Transverse median nervure in hind wings broken *below* the middle; third joint of the maxillary palpi *not* longer than the fourth; disco-cubital nervure *without* a stump of a vein.........(697) *Gonotypus* Förster.

Transverse median nervure in hind wings broken at the middle; third joint of the maxillary palpi longer than the fourth; disco-cubital nervure with a stump of a vein.....................(698) *Dioratica* Förster.

21. Ovipositor *not* projecting beyond the tip of the abdomen 22

Ovipositor prominent, always projecting beyond the tip of the abdomen.

Marginal cell very broad, the angle formed by the two abscissæ of the radius almost a right angle............(699) *Phædroctonus* Förster.

Marginal cell not very broad, the angle formed by the two abscissæ of the radius obtuse; claws pectinate...............(700) *Diocles* Förster.

22. Metathorax with the basal lateral and the middle lateral areas completely separated.................................(701) *Eriborus* Förster.

Metathorax with the basal lateral and the middle lateral areas confluent.
(702) *Nythobia* Förster.

23. Head transverse, *not* cubical, the temples not broad....................... 26

Head quadrate, or cubical, the temples broad, as broad or broader than the eyes.. 24

24. Ovipositor extending beyond the tip of the abdomen 25
Ovipositor *not* extending beyond the tip of the abdomen.
Metathorax with the areola and the petiolar area confluent; transverse median nervure in hind wings *not* broken ... (703) *Olesicampa* Förster.

25. Transverse median nervure in hind wings straight, *not* broken; metathorax with the basal lateral and the middle lateral areas separated, the spiracles rather long, ovate; clypeus anteriorly bluntly toothed; claws pectinate or *with* several teeth basally..(704) *Rhimphoctona* Förster.
Transverse median nervure in hind wings broken *below* the middle; metathorax with the basal lateral and the middle lateral areas *not* or very indistinctly separated; clypeus anteriorly slightly rounded or medially slightly angulate; claws *without* teeth basally.
(705) *Pyracmon* Holmgren.

26. Radius distinctly angularly broken 27
Radius curved, *not* or scarcely angularly broken.
Claws *without* teeth.......................... (706) *Diadegma* Förster.
Claws *with* teeth.
Second abdominal segment with the thyridia lying close on its base.
(707) *Sinophorus* Förster.
Second abdominal segment with the thyridia lying somewhat away from its base............................ (708) *Omoborus* Förster.

27. Spiracles of the first abdominal segment *not* prominent.................. 28
Spiracles of the first abdominal segment prominent...... (709) *Ecphora* Förster.

28. Spiracles of the second abdominal segment placed distinctly *behind* or beyond the middle.. 29
Spiracles of the second abdominal segment placed *at* or *before* the middle... 31

29. Metathorax *not* coarsely rugulose, *with* carinæ, the basal lateral and the middle lateral areas sharply separated; ovipositor very prominent, long.. 30
Metathorax coarsely rugulose *without* carinæ, and with only the spiracular area apparent; claws pectinate or at least basally; ovipositor projecting somewhat beyond tip of the abdomen...... (710) *Anepheres* Förster.

30. Discoidal cell at base fully as wide or somewhat wider than the length of the transverse median nervure; longer spur of hind tibiæ longer than the second joint of their tarsi............... (711) *Idechthis* Förster.
Discoidal cell at base not so wide as the length of the transverse median nervure; longer spur of hind tibiæ *not* so long as the second joint of their tarsi................................ (712) *Lathrostizus* Förster.

31. Transverse median nervure in hind wings angularly broken 32
Transverse median nervure in hind wings *not* angularly broken............. 38

32. Metathorax with the areola closed by a sharp carina and completely separated from the petiolar area.................................... 37
Metathorax with the areola and the petiolar area confluent, not separated.
Discoidal cell at base not twice as wide as the second discoidal at apex. 33
Discoidal cell at base twice or nearly twice as wide as the second discoidal cell at apex; ovipositor not projecting beyond tip of abdomen.
(713) *Lathroplex* Förster.

33. Second abdominal segment *not* twice as long as wide 34
Second abdominal segment twice as large as wide...... (714) *Omorgus* Förster.

34. Ovipositor projecting beyond the tip of the abdomen......................... 35
Ovipositor *not* projecting beyond the tip of the abdomen.
Metathorax with the petiolar area at least twice as long as the areola and strongly excavated, the surrounding carinæ very sharply elevated; fifth joint of hind tarsi distinctly shorter than the third.
(715) *Pantropa* Förster.

Metathorax with the petiolar area *not* twice as long as the areola and *not* strongly excavated, the surrounding carinæ neither sharp nor much elevated; spurs of hind tibiæ nearly equal in length, but not quite half the length of the basal joint; fifth tarsal joint as long as the third ....(716) *Asinamora* Förster.

35. Postpetiole pear-shaped; head seen from in front *not* rounded............. 36
Postpetiole *not* pear-shaped; head seen from in front rounded. (717) *Nemeritis* Holmgren.

36. Areolet distinctly petiolate; metathorax with the basal area lengthened, rectangular................................ (718) *Synetæris* Förster.
Areolet sessile or subsessile; metathorax with the basal area very short, scarcely visible...................................(719) *Spudastica* Förster.

37. Stigma narrow from the middle to the base, and from the middle to the apex equally pointed and narrowed; areolet sessile. (720) *Dolophron* Förster.
Stigma wide, obliquely truncate at apex; areolet sessile.(721) *Dimophora* Förster.

38. First abdominal segment *with* a sharp carina extending from each spiracle to apex of segment... 39
First abdominal segment *without* a sharp carina extending from each spiracle to apex of segment... 42

39. Second abdominal segment *not* twice as long as wide at the middle......... 40
Second abdominal segment twice as wide as long at the middle. (722) *Nepiera* Förster.

40. Metathorax with the spiracular and middle lateral areas *separated* by a sharp carina; longer spur of hind tibiæ a little longer than half the length of the basal joint of tarsi.................................. 41
Metathorax with the spiracular and middle lateral areas *not* separated by a sharp carina; longer spur of hind tibiæ about three-fourths the length of the basal joint of tarsi ....(723) *Hypothereutes* Förster.

41. The angle formed by the two abscissæ of the radius nearly a right angle; transverse median nervure in front wings originating far *beyond* the origin of the basal nervure; externo-median nervure in hind wings forming a *curve* with the transverse cubitus; ovipositor *not* exserted. (724) *Phobocampa* Förster.
The angle formed by the two abscissæ of the radius very obtuse; transverse median nervure in front wings interstitial, or almost, with the basal nervure; externo-median nervure in hind wings forming *no* curve with the transverse cubitus, but an angle; second abdominal segment at apex *not* wider than long.......(725) *Ischnoscopus* Förster.

42. Head seen from in front downward strongly lengthened................ 43
Head seen from in front downward *not* strongly lengthened............... 45

43. Externo-median nervure in hind wings *not* broken........................ 44
Externo-median nervure in hind wings straight, but broken at the origin of the transverse median nervure...............(726) *Rhexineura* Förster

44. Labial palpi strongly lengthened; last joint of hind tarsi *longer* than the third; ovipositor very long; spiracles of the second segment placed slightly beyond the middle.......................(727) *Bathyplectes* Förster.
Labial palpi *not* strongly lengthened; last joint of hind tarsi *not* longer than the third; ovipositor not longer than half the length of the abdomen; spiracles of second segment *not* placed beyond the middle. (728) *Canidia* Holmgren.

45. Ovipositor prominent or very distinctly projecting beyond the tip of the abdomen.. 46
Ovipositor *not* or only slightly projecting beyond the tip of the abdomen, at the most subexserted... 48

46. Abdomen in female only moderately compressed, *not* wholly smooth, the sutures distinct 47

Abdomen wholly smooth, the sutures of segments very fine, male (female abdomen strongly compressed, see p. 91)......(684) *Angitia* Holmgren.

47. Face in female narrower than the vertex, the eyes converging somewhat anteriorily toward the mouth; petiole a little longer than the hind coxæ...................................(729) *Meloboris* Holmgren.

Face in female *not* narrower than the vertex, the eyes *not* or very slightly converging anteriorly; petiole very distinctly longer than the hind coxæ.

Stigma wide.................................(730) *Tranosema* Förster.

Stigma *not* wide, narrow.

Postpetiole *without* lateral carinæ.............(731) *Campoletis* Förster.

Postpetiole *with* distinct lateral carinæ .....(732) *Limneria* Holmgren.

48. Recurrent nervure received by the areolet *before* the middle; antennæ ringed with white...............................(733) *Callidora* Förster.

Recurrent nervure received by the areolet *beyond* or behind the middle; antennæ *not* ringed with white, although sometimes with the flagellum pale toward the base 49

49. Last joint of hind tarsi shorter than the third; longer spur of hind tibiæ *not* two-thirds the length of the basal joint of tarsi 50

Last joint of hind tarsi as long as the third; longer spur of hind tibiæ about two-thirds the length of the basal joint of tarsi.
(734) *Holcocremnus* Förster.

50. Metathorax at the most incompletely aerolated, with only the spiracular areas distinguishable by faint carinæ.............(735) *Anilastus* Förster.

Metathorax distinctly or completely aerolated......(736) *Ameloctonus* Förster.

Tribe VI. PANISCINI.

1900. *Paniscini*, Tribe VI, Ashmead, Smith's Insects of New Jersey, p. 582.

This tribe is here characterized for the first time. It approaches nearest to the tribes *Mesochorini* and the *Banchini*. Förster placed most of the genera included in it among his family *Ophionoidæ*, a position not tenable, since the second recurrent nervure joins the cubital vein *beyond* the transverse cubitus and *not* before it, as in all genuine *Ophionini*.

From the *Mesochorini* it is separated by the position of the spiracles of the first abdominal segment, the different venation of the front wings, and the totally different genital characters of the males.

The characters made use of in my table of tribes ought to readily distinguish these insects, but other characters not mentioned there are the different facies of the head, the larger eyes, which are subemarginate or sinuate within, not distinctly entire, and the larger and more prominent ocelli.

Six genera have been placed in it, separable as follows:

TABLE OF GENERA.

Front wings *with* an areolet.. 2

Front wings *without* an areolet.

Scutellum convex, *not* margined laterally except at sides anteriorly or basally.................................(737) *Opheltoideus* Ashmead.
Type, *Opheltoideus johnsoni* Ashmead, manuscript.

2. Scutellum more or less margined laterally; cheeks and temples not broad.... 3
Scutellum *not* margined; cheeks and temples broad; second recurrent nervure joining the areolet beyond its middle.........(738) *Ophelles* Holmgren.
3. Transverse median nervure in hind wings broken *above* the middle; teeth of mandibles of an unequal length; clypeus separated 4
Transverse median nervure in hind wings broken *below* the middle; spiracles of first abdominal segment placed at or a little behind the middle; abdomen subcompressed; teeth of mandibles equal; clypeus *not* separated. (739) *Cidaphus* Förster.
4. Upper tooth of mandibles longer than the lower; metathoracic spiracles elongate or linear; scape at apex deeply emarginate; second abscissa of radius curved at base.
Submedian cell longer than the median, the transverse median nervure uniting with the median vein beyond the origin of the basal nervure; disco-cubital nervure broken by a stump of a vein, or at least with a trace of one, rarely without ....(740) *Paniscus* Gravenhorst.
Submedian and median cells equal or very nearly, the transverse median nervure most frequently interstitial with the basal nervure; disco-cubital nervure *not* broken by a stump of a vein. (741) *Parabates* Förster=*Parabatus* Thomson.
Upper tooth of mandibles shorter than the lower; metathoracic spiracles round; scape at apex only slightly emarginate; second abscissa of radius straight, *not* curved at base..........................(742) *Absyrtus* Holmgren.

Tribe VII. BANCHINI.

1868. *Banchoidæ*, Family 9, FÖRSTER, Verh. d. naturh. Ver. pr. Rheinl., XXV, pp. 141 and 157.
1894. *Banchini*, Tribe IX, ASHMEAD, Proc. Ent. Soc. Wash., III, p. 277.
1900. *Banchini*, Tribe VII, ASHMEAD, Smith's Insects of New Jersey, p. 582.

The insects falling in this tribe, so far as the position of the spiracles of the first abdominal segment is concerned, agree with the *Paniscini*, but may be readily separated by the differences noted in my table of tribes: The sessile abdomen, the venation of the front wings, the straight second abscissa of the radius, which is never strongly curved at its origin, and by the absence of the parapsidal furrows.

To this tribe I have ventured to remove the genus *Lapton* Nees, placed by European authorities with the *Pimplini*, since it clearly belongs here and no where else.

Rhynchobanchus Kriechbaumer is placed here doubtfully, as a synonym of *Semnophrys* Förster, from the description alone.

The thirteen genera belonging to the tribe are separable as follows:

TABLE OF GENERA.

Front wings *with* an areolet 4
Front wings *without* an areolet.
Transverse cubitus present 3
Transverse cubitus wanting 2
2. Abdomen compressed at the sides; disco-cubital nervure angularly broken. (743) *Tropistes* Gravenhorst.
Abdomen *not* compressed at the sides; disco-cubital nervure *not* angularly broken ....(744) *Ithagenes* Förster.

3. Abdomen subcompressed at apex, the ovipositor subexserted; disco-cubital nervure *not* broken by a stump of a vein.

Transverse median nervure *not* interstitial, the median cell longer than the submedian; mouth parts lengthened............(745) *Lapton* Nees.

4. Disco-cubital nervure *not* angularly broken, *without* a stump of a vein........ 6

Disco-cubital nervure angularly broken, *with* a stump of a vein, or at least a trace of one.. 5

5. Metathorax *without* a distinctly separated petiolar area; mesonotum *not* trilobed.

Head very broad, the forehead with a horn between the antennæ.
(746) *Semnophrys* Förster. ? = *Rhynchobanchus* Kreichbaumer.

Head not very broad, the forehead normal, without a horn.
(747) *Exetastes* Gravenhorst.

6. Areolet sessile; mouth parts normal.. 7

Areolet petiolate; mouth parts abnormal, the labium very elongate, forked at apex.. 11

7. Mesonotum *without* parapsidal furrows, the metathorax *without* a distinctly separated petiolar area.. 8

Mesonotum *with* parapsidal furrows, the metathorax *with* a large, distinctly separated petiolar area; second recurrent nervure joining the areolet at its hind angle; clypeus narrow, transverse; ovipositor prominent.
(748) *Xenochesis* Förster.

8. Areolet quadrangular.

Last joint of maxillary palpi normal.. 9

Last joint of maxillary palpi abnormal, knobbed; scutellum ending in a spine..................................(749) *Corynephanes* Wesmael.

9. Abdomen toward apex gradually acuminate, or pointed, with oblique furrows on segments 2 and 3.. 10

Abdomen toward apex more or less compressed and widened ventrally; no oblique furrows on segments 2 and 3.

Head normal, the labrum not elongate; claws in female pectinate.

Scutellum at apex armed with a thorn..(750) *Cidaphurus* Förster.

Scutellum simple, unarmed...........(751) *Banchus* Gravenhorst.

10. Claws in female with one or two teeth near the base.(752) *Ceratosoma* Cresson.

11. Mesonotum *without* parapsidal furrows; transverse median nervure in front wings *not* interstitial, the submedian cell slightly longer than the median.................(753) *Agathobanchus* Ashmead, new genus.
(Type, *Banchus æquatus* Say.)

Mesonotum *with* parapsidal furrows; transverse median nervure in front wings interstitial with the basal nervure......(754) *Agathilla* Westwood,

Tribe VIII. MESOCHORINI.

1868. *Mesochoroidæ*, Family 20, FÖRSTER, Verh. d. naturh. Ver. pr. Rheinl., XXV, pp. 143 and 170.

1892. *Mesochorini*, Tribe, ASHMEAD, Ent. News, III, p. 106.

1894. *Mesochorini*, Tribe X, ASHMEAD, Proc. Ent. Soc. Wash., III, p. 277.

1900. *Mesochorini*, Tribe VIII, ASHMEAD, Smith's Insects of New Jersey, p. 583.

The position of this tribe is somewhat uncertain. It comes evidently nearest to the *Paniscini*, although it is placed here after the *Banchini*.

The abdomen is distinctly petiolate and the tribe is at once separated from both of the above-mentioned tribes by the position of the spiracles of the first abdominal segment, which are situated *at* or *beyond* the middle, never *before* the middle, and by the rather large rhomboidal areolet of the front wings.

The abdomen in the males terminates in two long, slender spines, a character found in no other tribe.

Only three genera are known, and all have been found in our fauna.

TABLE OF GENERA.

Vertex of head *not* narrowed, the lateral ocelli distant from the margin of the eye. 2
Vertex of head narrowed, the ocelli large, the lateral close to the margin of the eye.
Claws pectinate .... (755) *Plesiophthalmus* Förster.
2. Claws pectinate; first abdominal segment *with* lateral carinæ extending backward from the spiracles; transverse median nervure in hind wings broken.
(756) *Astiphromma* Förster.
Claws simple; first abdominal segment *without* lateral carinæ from the spiracles; transverse median nervure in hind wings *not* broken.
(757) *Mesochorus* Gravenhorst.

Tribe IX. PORIZONINI.

1868. *Porizonoidæ*, Family 3, Förster, Verh. d. naturh. Ver. pr. Rheinl., XXV, pp. 141 and 147.
1894. *Porizonini*, Tribe III, Ashmead, Proc. Ent. Soc. Wash., III, p. 277.
1900. *Porizonini*, Tribe IX, Ashmead, Smith's Insects of New Jersey, p. 583.

With this tribe begins a series of tribes easily separated from those previously defined by the shape of the stigma, which is large and broad, either triangular or ovate, but never narrow-lanceolate, although otherwise approaching nearest to, or showing affinities with, the *Anomalini* and the *Campoplegini*.

Dr. Förster called these tribes families and separated them upon very slight characters. For example, the tribe *Porizonini* was separated from the three which follow by the middle vein in the hind wings being wanting or obliterated at its base or origin, while the basal nervure is distinctly thickened at its apex or where it unites with the costa or parastigma.

In our fauna are several species described under the genus *Cremastus*, with the above characters, and which evidently belong to Förster's genus *Temelucha*, in this tribe.

The genus *Orthopelma* Taschenberg, placed by European authorities in the tribe *Hemitelini*, is evidently identical with *Pröedrus* Förster, and is placed here on account of the position of the spiracles of the first abdominal segment.

Nineteen genera have been recognized in this tribe and are tabulated below:

TABLE OF GENERA.

First abdominal segment with the spiracles normal, *not* prominent 2
First abdominal segment with the spiracles very prominent...(758) *Probles* Förster.
2. Spiracles of first abdominal segment placed *behind* the middle, the abdominal segments not of an equal width throughout 3

Spiracles of the first abdominal segment placed *before* the middle, the abdominal segments of an equal width throughout, or nearly.
(759) *Orthopelma* Taschenberg=*Pröedrus* Förster.

3. Hind tarsi much lengthened, the basal joint shorter than the two following united; all femora and tibiæ swollen 4

Hind tarsi *not* much lengthened, the basal joint somewhat longer than the two following united; *not* all the femora and tibiæ swollen 5

4. Hind tibiæ hardly as long as the basal joint of tarsi or clearly shorter.
(760) *Barycnemis* Förster.

Hind tibiæ fully as long or longer than the basal joint of tarsi.
(761) *Porizon* Gravenhorst.

5. Frons *not* narrowed; eyes sometimes large, but *not* semiglobose 6

Frons narrowed; eyes very large, semi-globose.
Metathoracic spiracles placed somewhat far from the metapleura.
(762) *Allophrys* Förster.

6. Second discoidal cell entirely or almost entirely closed at apex 7

Second discoidal cell, by a break in the transverse nervure, quite open at apex.
Discoidal transverse nervure wanting .... (763) *Sathropterus* Förster.
Discoidal transverse nervure present .... (764) *Aneuclis* Förster.

7. Hind femora and tibiæ *not* thickened; metathorax with the petiolar area, if present, *longer* than half the length of the metanotum 8

Hind femora and tibiæ somewhat thickened; metathorax long, with the petiolar area shorter than half the length of the metanotum.
(765) *Leptopygus* Förster.

8. Metanotum areolated 9

Metanotum *not* areolated, rugose or rugulose .... (766) *Gonolochus* Förster.

9. Metathoracic spiracles very close to the pleural carina 10

Metathoracic spiracles somewhat distant from the pleural carina.
Maxillary palpi abnormally lengthened, extending nearly to the middle coxæ .... (767) *Dolichopselephus* Ashmead.
Maxillary palpi normal; metanotum long .... (768) *Temelucha* Förster.

10. Mesonotum *with* deep parapsidal furrows; carinæ inclosing the petiolar area very sharp 11

Mesonotum *without* pariapsidal furrows 12

11. Antennæ stout, 25-jointed, joints 14 to 20 wider than long; cubital transverse nervure in hind wings a little longer than the first abscissa of the median vein; ovipositor very short .... (769) *Epistathmus* Förster.

Antennæ *not* stout, 31-jointed, the penultimate joint wider than long; cubital transverse nervure in hind wings shorter than the first abscissa of the median vein; ovipositor longer than the abdomen.
(770) *Diaparsis* Förster.

12. Antennæ shortened, 20-jointed or less 13

Antennæ lengthened, more than 20-jointed .... (771) *Thersilochus* Holmgren.

13. Maxillary palpi not unusually long 14

Maxillary palpi very long .... (772) *Heterocola* Förster.

14. Metanotum with the median lateral areas *not* smooth 15

Metanotum with the median lateral areas smooth .... (773) *Ischnobatis* Förster.

15. Antennæ more than 13-jointed 16

Antennæ 13-jointed or less .... (774) *Phradis* Förster.

16. Antennæ stout, the last joint longer than the two preceding joints united.
(775) *Eutomus* Förster.

Antennæ not especially stout.
Stigma wide; base of discoidal cell longer than the apex of the second discoidal cell; hind wings with the first abscissa of radius much longer than the cubital tranverse nervure .... (776) *Isurgus* Förster.

Stigma rather narrow; base of discoidal cell *not* or hardly longer than the apex of the second discoidal cell; hind wings with the first abscissa of radius as long or somewhat longer than the cubital transverse nervure. (777) ***Astrenis*** **Förster.**

Tribe X. PRISTOMERINI.

1868. *Pristomeroidæ*, Family 4, Verh. d. naturh. Ver. pr. Rheinl., XXV, pp. 141 and 149.
1894. *Pristomerini*, Tribe IV, Ashmead, Proc. Ent. Soc. Wash., III, p. 277.
1900. *Pristomerini*, Tribe X, Ashmead, Smith's Insects of New Jersey, p. 584.

This tribe differs from the foregoing by having the middle vein in the hind wings *distinct*, entire, *not* obliterated toward the base. In this character it agrees with the *Cremastini* and the *Plectiscini*, but is separated from both by the hind femora being armed with a strong tooth beneath, a little beyond the middle or toward their apices.

Only two genera have been recognized, one being characterized here for the first time, as follows:

TABLE OF GENERA.

Metanotum completely areolated, the median and the petiolar areas always separated; stigma large, wide; areolet wanting.

Hind femora considerably swollen, with a large tooth beneath a little beyond the middle, followed by some small or minute teeth; metanotum with the areola hexagonal; transverse median nervure in hind wings slightly angularly broken *below* the middle ....(778) *Pristomerus* Holmgren.

Hind femora scarcely swollen, with a tooth beneath near the apex; metanotum with the areola pentagonal; transverse median nervure in hind wings straight, *not* broken ....(779) *Pristomeridia* Ashmead, new genus. (Type, *Porizon agilis* Cresson.)

Tribe XI. CREMASTINI.

1868. *Cremastoidæ*, Family 5, Förster, Verh. d. naturh. Ver. pr. Rheinl., XXV, pp. 141 and 149.
1887. *Cremastina*, Tribus, Thomson, Opus. Ent., XI, p. 1048.
1894. *Cremastini*, Tribe V, Ashmead, Proc. Ent. Soc. Wash., III, p. 277.
1900. *Cremastina*, Tribe XI, Ashmead, Smith's Insects of New Jersey, p. 584.

Differs from the *Pristomerini* in having simple, unarmed hind femora, and from the *Plectiscini*, in the character of the head, which is larger, by the clypeus being neither convex nor compressed from the sides, and by the normally formed hind tibiæ.

Most of the species placed in our lists under the genus *Cremastus* do not belong to it, but should be placed in the genus *Temelucha* Förster, in the tribe *Porizonini*.

Only two genera have been recognized, as follows:

TABLE OF GENERA.

Head not wider than the thorax; clypeus distinctly separated from the face; radius originating from the middle of the stigma ....(780) *Cremastus* Gravenhorst.

Head wider than the thorax; clypeus separated from the face at the sides only; radius originating from *behind* the middle of the stigma..(781) *Demophorus* Thomson.

Tribe XII. PLECTISCINI.

1868. *Plectiscoidæ*, Family 22, FÖRSTER, Verh. d. naturh. Ver. pr. Rheinl., XXV, pp. 143 and 170.
1871. *Plectiscoidæ* FÖRSTER, Verh. d. naturh. Ver. pr. Rheinl., XXVII, p. 71.
1888. *Plectiscina*, Tribus, THOMSON, Opus. Ent., XII, p. 1170.
1894. *Plectiscini*, Tribe XI, ASHMEAD, Proc. Ent. Soc. Wash., III, p. 277.
1897. *Plectiscini*, Tribe, DAVIS, Trans. Am. Ent. Soc., XXIV, p. 240.
1900. *Plectiscini*, Tribe XII, ASHMEAD, Smith's Insects of New Jersey, p. 585.

This tribe, as at present defined, is scarcely a natural minor group, since it comprises several discordant genera, with affinities allying them to genera in the *Cryptinæ*, the *Tryphoninæ*, and the *Pimplinæ*. Davis, without stating his reasons for so doing, placed the group with the *Tryphoninæ*. This is clearly an unnatural position for the majority of the genera, the only genus which could be removed to that group being *Pammicra* Förster, and I have tabulated that with the tribe *Tryphonini*. To me this tribe, as at present defined, comes nearest to the *Porizonini*, and is here placed at the end of the Ophionid series as less liable to create a disturbing element in the present arrangement of the subfamilies and tribes than if placed elsewhere.

Thirty-one genera are placed in this tribe, separable as follows:

TABLE OF GENERA.

Labrum *not* or scarcely exserted.. 4
Labrum more or less widely exserted.
  Metanotum *without* areas.. 2
  Metanotum *with* areas, or at least always with an areola.. 3
2. Front wings *without* an areolet..................(782) *Adelognathus* Holmgren.
  Front wings *with* an areolet..........................(783) *Synæma* Förster.
3. Labrum at apex *deeply* emarginate; areolet in front wings *absent*; abdominal segments two and three, quite smooth............(784) *Notomeris* Förster.
  Labrum at apex *not* emarginate; areolet in front wings *present;* abdominal segments two and three, *not* smooth.............(785) *Cnemischys* Förster.
4. Ovipositor most frequently prominent, *not* hook-like, curved at apex........ 5
  Ovipositor *not* prominent, but hook-like, curved at apex.
    Front wings *without* an areolet...................(786) *Grypocentrus* Ruthe.
    Front wings *with* an areolet...................(787) *Campothreptus* Förster.
5. Front wings *with* an areolet.. 6
  Front wings *without* an areolet.. 12
6. Head with the vertex not especially broad, the cheeks *not* buccate; areolet not transverse 7
  Head with the vertex broad, the cheeks buccate; areolet transverse, broadly sessile ....(788) *Macrochasmus* Thomson.
7. Face *not* narrowed toward the mouth.. 8
  Face narrowed toward the mouth.
    Clypeus convex, separated from the face by a faint furrow.
(789) *Catastenus* Förster.
    Clypeus almost flat or very feebly convex .... (790) *Symplecis* Förster.
8. Metanotum areolated 9
  Metanotum *not* areolated ....(791) *Aperileptus* Förster.

9. Clypeus convex and at the sides anteriorly more or less compressed........ 11
Clypeus quite flat.
  Cheeks separated from the face by a deep furrow; metanotum with 3 or 5 areas 10
  Cheeks *not* separated from the face by a deep furrow; metanotum with 6 areas; antennæ ending in a club............(792) *Holomeristus* Förster.

10. Clypeus transverse; metanotum with 3 areas at base.....(793) *Entypoma* Förster.
Clypeus subrhomboidal; metanotum with 5 areas at base.
(794) *Blapticus* Förster.

11. Face separated from the clypeus by quite a broad sharp furrow, but without a transverse furrow, the clypeus very small, striate, much compressed from the sides, with large lateral foveæ...............(795) *Dialipsis* Förster.
Face separated from the clypeus by a transverse furrow.
  Abdomen distinctly, longly petiolate and compressed toward apex, the petiole and second segment basally finely rugulose or coriaceous; face smooth, polished, not tubercular ....(796) *Plectiscus* Gravenhorst.
  Abdomen subsessile, depressed, polished, in outline oval; face punctate and medially tubercular ....(797) *Cyrtocentrus* Provancher.

12. First joint of the flagellum as long as or longer than the second............ 13
First joint of the flagellum shorter than the second.
  Second flagellar joint in male emarginate..........(798) *Miomeris* Förster.
  Second flagellar joint in male simple................(799) *Aniseres* Förster.

13. Flagellar joints 5–7, in male strongly emarginate; metathorax at apex perpendicularly truncate; hind coxæ granulated.
(800) *Helectes* Haliday = *Idioxenus* Förster.
Flagellar joints 5–7 in male *not* emarginate; metathorax in female not truncate posteriorly; hind coxæ *not* granulated.
  Metanotum *not* separated into two divisions by an impressed cross line before the middle 14
  Metanotum separated into two divisions by an impressed cross line before the middle ....(801) *Dicolus* Förster.

14. Vertex *not* separated from the occiput by a transverse ridge, open at the middle 15
Vertex separated from the occiput by a transverse ridge.................... 16

15. Stigma broad; third flagellar joint emarginate ....(802) *Apoclima* Förster.
Stigma narrow; third flagellar joint simple ....(803) *Ateleute* Förster.

16. Stigma *not* narrow 17
Stigma very narrow.................................(804) *Polyaulon* Förster.

17. Metanotum at base distinctly areolated.. 19
Metanotum at base *not* distinctly and regularly areolated.
  Antennæ 30-jointed or more... 18
  Antennæ less than 30-jointed ....(805) *Hemiphanes* Förster.

18. Abdomen very strongly compressed from the fourth segment.
(806) *Myriarthus* Förster.
Abdomen flat, *not* compressed from the sides, but spatulate.
(807) *Megastylus* Schiödte.

19. Last tarsal joint normal 20
Last tarsal joint very much thickened................(808) *Symphylus* Förster.

20. Transverse median nervure in hind wings distinctly broken................. 21
Transverse median nervure in hind wings *not* broken.
  First flagellar joint longer than the second; ovipositor projecting beyond the tip of abdomen ....(809) *Eusterinx* Förster.
  First flagellar joint equal to the second or very slightly shorter; ovipositor *not* projecting beyond the tip of abdomen...(810) *Pantisarthrus* Förster.

21. First abscissa of the radius quite straight, forming with the second a sharp angle; transverse median nervure in hind wings broken, with a distinct process..(811) *Entelechia* Förster.

First abscissa of the radius distinctly curved and *not* forming a sharp angle with the second; transverse median nervure in hind wings broken, *without* a process.

Hind femora and tibiæ thickened; external median area prominently toothed.................................(812) *Gnathochorisis* Förster.

Hind femora and tibiæ *not* thickened; external median area *not* prominently toothed..............................(813) *Proclitus* Förster.

Family XXVII. ALYSIIDÆ.

1811. *Ichneumonides adsciti* NEES (part) Der Ges. naturf. Fr. z. Berl. Mag., V, p. 3.
1815. *Alysiada* LEACH, Edinb. Encyclop., IX, p. 143.
1835. *Exodontes* WESMAEL, Nouv. Mém. Acad. Sci. Brux., IX, p. 11.
1838. *Braconidæ*, Family 4 (part), HALIDAY, Ent. Mag., V, p. 4.
1839. *Ichneumonidæ*, Family 6 (part), HALIDAY, Hym. Synop., p. ii.
1887. *Exodontes*, Div. V, CRESSON, Syn. Hym. North America, p. 62.
1888. *Exodontes* MARSHALL, Species Hym. des Braconides, I, p. 67.
1900. *Alysiidæ*, Family LXXVII, ASHMEAD, Smith's Insects of New Jersey, p. 585.

This family is composed of a great number of minute, or at least small-sized, ichneumon flies that attack almost exclusively the larvæ of Dipterous insects.

It has been treated by most authorities as a group, or two groups, in the family *Braconidæ*, with which the majority of the species agree in their venational characters—the front wings being without a costal cell and having but a single recurrent nervure, the first.

In 1894 I, however, described my genus *Lysiognatha*, an insect agreeing closely with the *Alysiinæ* in its cephalic, mandibular, and other characters, but differing from all known genera in that group by having *two* distinct recurrent nervures. This discovery upset the division between the *Ichneumonidæ* and the *Braconidæ*, based upon the number of the recurrent nervures, and I am therefore of the opinion that the *Alysiinæ*, *Dacnusinæ*, and the *Lysiognathinæ* should be treated as a distinct family from the *Ichneumonidæ* and the *Braconidæ*, since the family is readily distinguished from both by the peculiar attachment of the mandibles.

The three subfamilies noted may be separated as follows:

TABLE OF SUBFAMILIES.

Front wings with only *one* recurrent nervure.................................... 2

Front wings with *two* recurrent nervures............ Subfamily I. LYSIOGNATHINÆ.

2. Front wings with *three* cubital cells, or if with two only the *first* transverse cubitus is wanting; apterous forms occasionally....... Subfamily II. ALYSIINÆ.

Front wings with *two* cubital cells, the *second* transverse cubitus wanting, the first transverse cubitus always present; no apterous forms.
Subfamily III. DACNUSINÆ.

Subfamily I. LYSIOGNATHINÆ.

1895. *Lysiognathinæ*, Subfamily I, Proc. Ent. Soc. Wash., III, p. 277.

This subfamily is separated from the *Alysiinæ*, with which it agrees in having *three* cubital cells, by having *two* distinct recurrent nervures.

It is represented at present by a single genus distinguished as follows:

Head subquadrate, seen from in front wider than long, the vertex bilobed; clypeus narrowly transverse; mandibles widely separated, bidentate at apex, and spreading wide open as in *Alysia;* abdomen sessile, in outline oblong-oval, subcompressed at apex and ending in a prominent ovipositor; second cubital cell in front wings small, oblique, subrhomboidal, similar to the areolet in *Pimpla*.
(814) *Lysiognatha* Ashmead.

Subfamily II. ALYSIINÆ.

1862. *Alysioidæ*, Family 25, Förster, Verh. d. naturh. Ver. pr. Rheinl., XIX, pp. 229 and 263.
1885. *Alysiides* Marshall, Tr. Ent. Soc. Lond., p. 11.
1887. *Alysiinæ* Cresson, Syn. Hym. North America, p. 62.
1888. *Alysiidæ* Marshall, Species des Hym. des Braconides, I, p. 67.
1900. *Alysiinæ*, Subfamily II, Ashmead, Smith's Insects of New Jersey, p. 585.

The wings in this tribe have only *one* recurrent nervure and three cubital cells, the latter being the only character to distinguish it from the *Dacnusinæ*. In it are included all wingless or subapterous forms.

Two minor groups or tribes have been recognized, distinguished by venational characters, as follows:

TABLE OF TRIBES.

Winged forms 2
Wingless forms .... Tribe II. Allœini
2. Front wings with a large, distinct stigma, which is triangular, oval, or subovate, never linear or narrowly lanceolate; hind wings *with* a recurrent nervure, and also most frequently with a radius .... Tribe I. Alysiini.
Front wings with the stigma linear or narrowly lanceolate, never broad; hind wings *without* a recurrent nervure and usually *without* a radius.
Tribe II. Allœni.

Tribe I. ALYSIINI.

In this tribe are placed all winged forms having a large, distinct, triangular, oval, or subovate stigma, never with a linear or narrowly-lanceolate stigma, and always having a more or less distinct recurrent nervure in the hind wings.

Twenty-seven genera, with these characters, are tabulated below:

TABLE OF GENERA.

Second abscissa of radius shorter than the first transverse cubitus, very rarely as long or a little longer 2
Second abscissa of radius *much* longer than the first transverse cubitus 13
2. Second transverse cubitus always distinct 3
Second transverse cubitus incomplete or subobsolete.
(815) *Asyntactus* Marshall.

3. Second abdominal segment *with* a distinct transverse impressed line, usually indicated by a difference in the sculpture, whereby the segment is separated into two divisions.. 4
Second abdominal segment *without* a transverse impressed line.............. 5

4. Recurrent nervure received by the first cubital cell; stigma large oval, the radius originating from beyond its middle; third and following abdominal segments distinctly separated...............(816) *Trachyusa* Ruthe.
Recurrent nervure received by the second cubital cell; second discoidal cell *not* completely closed at apex; third and following segments closely united, indistinctly separated.................(817) *Symphanes* Förster.

5. Recurrent nervure received by the second cubital cell........................ 6
Recurrent nervure *interstitial* or received by the first cubital cell............ 8

6. Second discoidal cell completely closed.. 7
Second discoidal cell open at apex; first joint of the flagellum longer than the second....................................(818) *Pentapleura* Förster.

7. Radius originating from *before* the middle of the stigma. (819) *Hypostropha* Förster.
Radius originating from the *middle* of the stigma; first and second joints of flagellum subequal; subdiscoidal nervure originating from or a little above the middle of the discoidal nervure......(820) *Epiclista* Förster.
Radius originating from *beyond* the middle of the stigma; subdiscoidal nervure interstitial....................................(821) *Goniarcha* Förster.

8. Radius originating from *beyond* the middle of the stigma..................... 9
Radius originating from *before* the middle of the stigma.(822) *Tanycarpa* Förster.

9. Discoidal nervure oblique or angulate, the subdiscoidal nervure *not* interstitial... 10
Discoidal nervure straight, the subdiscoidal nervure *interstitial* or nearly; spiracles of metathorax small, round...........(823) *Cratospila* Förster.

10. Spiracles of metathorax very small, punctiform.................................. 11
Spiracles of metathorax very large......................(824) *Alysia* Latreille.

11. First joint of the flagellum somewhat longer than the second............... 12
First joint of the flagellum distinctly shorter than the second.
  Scutellum conical, the postscutellum armed with a spine or tubercle; wings maculate, the second cubital cell narrow.
(825) *Hoplitalysia* Ashmead, new genus.
(Type, *Hoplitalysia slossonæ* Ashmead, manuscript.
  Scutellum at the most convex; wings not maculate, the second cubital cell normal..(826) *Idiasta* Förster.

12. Recurrent nervure interstitial..........................(827) *Anarcha* Förster.
Recurrent nervure received by the first cubital cell.....(828) *Strophæa* Förster.

13. First joint of the flagellum scarcely so long as the second or clearly *shorter*.. 16
First joint of the flagellum always somewhat *longer* than the second.
  Second discoidal cell present.. 14
  Second discoidal cell *absent*......................(829) *Opisendra* Förster.

14. Stigma *not* unusually thickened.. 15
Stigma very large and unusually thickened, the recurrent nervure received by the second cubital cell.
  Abdomen with three segments, as in *Œnone* Haliday, the second the largest; marginal cell not quite extending to tip of wing; second discoidal cell open at lower apical angle....(830) *Œnonogastra* Ashmead, new genus.
(Type, *Mesocrina microrhopalæ* Ashmead.
  Abdomen with the normal number of segments; marginal cell extending to tip of wing...................................(831) *Prosapha* Förster.

15. Radius originating *before* the middle of the stigma.

Recurrent nervure received by the first cubital cell..(832) *Acrobela* Förster.

Recurrent nervure received by the second cubital cell. (833) *Orthostigma* Ratzeburg.

Radius originating at or a little beyond the middle of the stigma. (834) *Mesocrina* Förster.

16. Marginal cell closed *before* the tip of the wing.......................... 17

Marginal cell closed at the tip of the wing.......................... 19

17. Recurrent nervure received by the *second* cubital cell 18

Recurrent interstitial or received by the first cubital cell.

Recurrent nervure received by the *first* cubital cell; subdiscoidal nervure originating far *below* the middle of the discoidal nervure; mesonotal furrows entirely wanting....................(835) *Homophyla* Förster.

Recurrent nervure distinctly *interstitial;* subdiscoidal nervure interstitial or nearly; mesonotal furrows distinct.............(836) *Mesothesis* Förster.

18. Anal cell in hind wings *not* extending beyond the middle of the median cell. (837) *Misophthora* Förster.

Anal cell in hind wings extending beyond the middle of the median cell. (838) *Adelura* Förster.

19. Second discoidal cell completely closed.

Submedian cell closed *just* behind the basal nervure; radial cell in hind wings normal, *not* divided by a transverse nervure.................. 20

Submedian cell closed *far* behind the basal nervure; radial cell in hind wings divided into two by a transverse nervure..(839) *Idiolexis* Förster.

20. First abscissa of radius forming with the second nearly a straight line; mesonotal furrows absent; subdiscoidal nervure originating from *below* the middle of the discoidal nervure..................(840) *Aclisis* Förster.

First abscissa of radius forming with the second a strong angle; mesonotal furrows distinct, uniting at about half the length of the mesonotum or a little beyond, and thence as a deep sulcus toward the scutellum, the middle lobe usually with a median grooved line; subdiscoidal nervure interstitial or nearly........................(841) *Phænocarpa* Förster.

Tribe II. ALLŒINI.

This tribe is composed of all wingless and subapterous Alysiids, and winged forms having a linear or lanceolate stigma, the hind wings being *without* a recurrent nervure.

Twenty-two genera have been recognized, distinguishable as follows:

TABLE OF GENERA.

Fully winged.. 3

Wingless or with abbreviated wings.................................... 2

2. Wingless.

Head large; viewed from above, bilobed; second joint of flagellum much longer than the first ....(842) *Chasmodon* Haliday.

Subapterous or with abbreviated wings.

Wings *without* a distinct venation; head subglobose; first joint of flagellum longer than the second .... (843) *Panerema* Förster.

Wings *with* a distinct venation, the submedian cell confluent with the second discoidal; head, transverse; male................ (844) *Allœa* Haliday.

3. First cubital and first discoidal cells separated.......................... 5

First cubital and first discoidal cells confluent, the first abscissa of the cubitus absent.. 4

4. Second abscissa of the radius *longer* than the first transverse cubitus; second discoidal cell wanting........................ (845) *Aphæreta* Förster.
Second abscissa of the radius *shorter* than the first transverse cubitus.
Maxillary palpi 4, labial palpi 3, jointed........... (846) *Syncrasis* Förster.
Maxillary palpi 3, labial palpi 2, jointed .... (847) *Phænolyta* Förster.

5. First transverse cubital nervure present, the first and second cubital cells separated 6
First transverse cubital nervure wanting, the first and second cubital cells confluent.
Second discoidal cell present....................(848) *Synaldis* Förster.

6. Stigma *linear*, not at all thickened 9
Stigma somewhat thickened or narrowly lanceolate.
Second abscissa of the radius very much longer than the transverse cubitus; second discoidal cell wanting, or open at apex; rarely closed........ 7
Second abscissa of the radius hardly longer than the first transverse cubitus; second discoidal cell closed, the subdiscoidal nervure interstitial; female (see p. 106) ....(844) *Allœa* Haliday.

7. First joint of the flagellum shorter than the second; marginal cell closed at apex of wing.
Second discoidal cell wanting or open at apex.......................... 8
Second discoidal cell distinct, closed at apex; first abscissa of radius distinct..........................(849) *Kahlia* Ashmead,[1] new genus.
(Type, *Kahlia flavipes* Ashmead, manuscript.)

8. First abscissa of radius wanting, the second cubital cell therefore contiguous to the stigma or sessile; second discoidal cell present but open at apex.
(850) *Sathra* Förster.
First abscissa of radius very distinct, the second cubital cell widely separated from the stigma or petiolate; second discoidal cell entirely absent or only partially formed................................(851) *Asobara* Förster.

9. First joint of the flagellum distinctly longer than the second................ 11
First joint of the flagellum *not* longer than the second, usually shorter...... 10

10. Recurrent nevure *interstitial* or received by the *first* cubital cell; second discodial cell entirely wanting ....(852) *Spanista* Förster.
Recurrent nervure received by the *second* cubital cell.
Mesopleura with a smooth, transverse impression; antennæ about 50-jointed..................................(853) *Dapsilartha* Förster.
Mesopleura with a crenate, transverse impression; antennæ 17 to 24 jointed.
(854) *Ischnocarpa* Förster.

11. First and second abscissæ of the radius forming a strong or an obtuse angle.. 12
First and second abscissæ of the radius forming almost a straight line.
(855) *Anisocyrta* Förster.

12. Recurrent nervure received by the *second* cubital cell........................ 13
Recurrent nervure received by the *first* cubital cell or *interstitial*............ 18

13. Metathoracic spiracles very small, punctiform 14
Metathoracic spiracles moderately large, round, distinct.
Subdiscoidal nervure originating much *below* the middle of the discoidal nervure..............................(856) *Dinotrema* Förster.

14. Cubitus *not* abbreviated immediately behind the transverse cubital nervure. 15
Cubitus abbreviated immediately behind the transverse cubital nervure; subdiscoidal nervure wanting ....(857) *Coloboma* Förster.

15. Antennæ more than 13-jointed 16
Antennæ 13-jointed..................... ....(858) *Spanomeris* Förster.

16. Stigma *not* thickened and scarcely distinguishable from the wing border; subdiscoidal nervure originating from or *below* the middle of the discoidal nervure.. 17

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[1] In honor of Prof. Hugo Kahl.

Stigma linear but somewhat thickened and readily distinguishable from the wing border; subdiscoidal nervure distinct, originating from *above* the middle of the discoidal nervure........................(859) *Delocarpa* Förster.

17. Vertex concave; thorax compressed laterally............(860) *Dipiesta* Förster.

Vertex convex; thorax not compressed laterally.........(861) *Aspilota* Förster.

18. Second discoidal cell open; marginal cell closed *before* the apex of the wing. (862) *Heterolexis* Förster.

Second discoidal cell closed; marginal cell closed at the apex of the wing. (863) *Grammospila* Förster.

Subfamily III. DACNUSINÆ.

1862. *Dacnusoidæ*, Family XXVI, Förster, Verh. d. Naturh. Ver. pr. Rheinl., XIX, pp. 229 and 273.

1885. *Dacnusides* Marshall, Trans. Ent. Soc. Lond., p. 11.

1887. *Dacnusinæ*, Subfamily, Cresson, Syn. Hym. North America, p. 63.

1888. *Dacnusidæ*, Tribe XXIV, Marshall, Species des Hym. des Braconides, I, p. 67.

1900. *Dacnusinæ*, Subfamily III, Ashmead, Smith's Insects of New Jersey, p. 586.

The insects falling in this subfamily have the same habits as the *Alysiinæ* and exhibit scarcely any structural difference; the only character yet pointed out to separate them from the preceding being the difference of venation in the front wings.

The *Dacnusinæ* have only *two cubital cells* while the Alysiinæ have *three*, except in one or two cases where the first transverse cubitus is absent, so that the student must be careful not to place these in this subfamily. In all genuine Dacnusines the *first transverse cubitus is always present.* He must also bear in mind that there are no apterous females in this group.

Twenty-five genera have been recognized, separable as follows:

TABLE OF GENERA.

First cubital and first discoidal cells separated, distinct.......................... 2

First cubital and first discoidal cells confluent................(864) *Aphanta* Förster.

2. Abdomen *not* strongly rugulose; segments 2 and 3 *not* connate, flexible; postscutellum normal.. 3

Abdomen strongly rugulose; segments 2 and 3 connate, not flexible; postscutellum armed with a spine or thorn. (865) *Symphya* Förster = *Œnone* Haliday.

3. Eyes bare.. 4

Eyes hairy.

Stigma short, thick, the radius originating from its middle. (866) *Chænusa* Haliday.

Stigma lengthened, linear, the radius originating from *before* its middle. (867) *Chorebus* Haliday.

4. Recurrent nervure not joining the second cubital cell...................... 5

Recurrent nervure joining the second cubital cell just behind the transverse cubitus...(868) *Exotela* Förster.

5. Labial palpi 4-jointed.. 6

Labial palpi 3-jointed.

Stigma linear; marginal cell *not* extending to tip of wing, the second discoidal cell closed, the subdiscoidal nervure originating *below* the middle of the discoidal nervure............(869) *Amētria* Förster.

6. Radius angularly broken; second cubital cell petiolate, the first abscissa of the radius distinct.. 7
Radius *not* angularly broken; second cubital cell sessile, the first abscissa of the radius wanting...............................(870) *Agonia* Förster

7. Second abdominal segment *without* a median cross line, usually quite smooth. 8
Second abdominal segment *with* an incomplete median cross line or depression, the surface anteriorly to same wrinkled.
Stigma rather thick, as wide as the first abscissa of the radius is long; first joint of flagellum much longer than the second.
(871) *Epimicta* Förster.

8. Stigma very thick and wider than the first abscissa of the radius is long..... 9
Stigma *not* especially thickened and also *not* wider than the first abscissa of radius is long 10

9. Radius terminating not far from the tip of the wing...(872) *Pachysema* Förster.
Radius terminating very far from the tip of the wing.
(873) *Brachystropha* Förster.

10. Stigma short, not extending to half the length of the marginal cell......... 11
Stigma elongate, extending to half or more than half the length of the marginal cell 14

11. Head quadrate, or much elongate, the abdomen elongate, compressed...... 12
Head transverse, or transverse-quadrate, wider than the thorax, the abdomen less elongate, not much compressed; stigma triangular......... 13

12. Head much elongate; abdomen in female strongly compressed, sword-shaped; mesonotum *without* parapsidal furrows, or at most represented by an elongate fovea..........(874) *Chaenon* Curtis = *Copidura* Schiödte.
Head quadrate; abdomen in female only compressed at apex; mesonotum *with* parapsidal furrows, which converge and usually meet at the middle and thence as a deep furrow to the scutellum.
(875) *Cœlinius* Nees.

13. Radius originating a little *before* the middle of the stigma and extending to the apex of the wing, the first abscissa of the radius long, twice the length of the first abscissa of the cubitus; first cubital cell about thrice as long as the first discoidal cell; second discoidal cell wanting ....(876) *Provancheria* Ashmead,[1] new genus
(Type, *Eubadizon gracilis* Provancher.)
Radius originating a little *behind* the middle of the stigma and joining the costa a little before the tip of the wing, the first abscissa *not* or scarcely as long as the first abscissa of the cubitus; first cubital cell only a little longer than the first discoidal; second discoidal cell present; abdomen scarcely longer than the head and thorax united.
(877) *Polemon* Giraud.

14. Recurrent nervure joining the first cubital cell 15
Recurrent nervure interstitial with the first transverse cubitus.
Mesonotum *without* parapsidal furrows or the same only slightly indicated anteriorly; abdomen short, subpetiolate .....(878) *Mesora* Förster.

15. First and second abscissæ of the radius of an *unequal* length................ 16
First and second abscissæ of the radius of an equal length.
(879) *Isomerista* Förster.

16. Transverse cubitus, the second abscissa of the cubitus, and the recurrent nervure of an *unequal* length 17
Transverse cubitus, the second abscissa of the radius, and the recurrent nervure of an *equal* length ....(880) *Trisisa* Förster.

17. Stigma *not* always linear, or of an equal breadth or thickness throughout; metanotum *not* thickly hairy, always rugose or wrinkled............ 18

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[1] In honor of Abbe L. Provancher.

Stigma linear, of an equal thickness throughout, or very imperceptibly thickened toward hip; metathorax and first segment of abdomen thickly hairy.

Marginal cell extending almost to the tip of wing. (881) *Tanystropha* Förster.

Marginal cell shorter, *not* nearly extending to tip of wing. (882) *Rhizarcha* Förster.

18. Marginal roundly widened; second abscissa of the radius *not* equally and regularly curved, therefore *not* forming a perfect segment of a circle. 19

Marginal cell narrower; second abscissa of the radius quite regularly curved, forming a perfect segment of a circle.

Second discoidal cell closed........................(883) *Gyrocampa* Förster.

Second discoidal cell open ....(884) *Synelix* Förster.

19. Second discoidal cell completely closed.................................... 20

Second discoidal cell open at apex or entirely absent.

Antennæ in female with *more* than 20 joints.......(885) *Dacnusa* Haliday.

Antennæ in female with *less* than 20 joints.

Second discoidal cell absent.................(886) *Coloneura* Förster.

Second discoidal cell present but *open* behind; parapsidal furrows wanting or indicated only anteriorly.....(887) *Stiphrocera* Förster.

20. Marginal cell long and wide, extending to the apex of the wing; first joint of flagellum a little longer than the second ....(888) *Liposcia* Förster.

Family LXXVIII. BRACONIDÆ.

1811. *Ichneumon adsciti* Nees (part), Der Ges. naturf. Fr. z. Berl. Mag., V, p. 3.
1811. *Bracones*, Family I, Der Ges. naturf. Fr. z. Berl. Mag., V, p. 3.
1838. *Braconidæ*, Family IV, Haliday (part), Ent. Mag., V, p. 4.
1885. *Braconidæ*, Family, Marshall (part), Trans. Ent. Soc. Lond., p. 1.
1887. *Braconidæ* Cresson (part), Syn. Hym. North America, p. 53.
1900. *Braconidæ*, Family LXXVIII, Ashmead, Smith's Insects of New Jersey, p. 586.

This family is here restricted to the Braconids having the mandibles normally attached, as in the Ichneumonids, and touching or overlapping each other when closed, never attached to the sides of the face and spreading wide open as in the *Alysiidæ*.

In structure and habits the *Braconidæ* are nearest related to the *Ichneumonidæ*, but are easily separated by having only *one* recurrent nervure, or none, and by the absence of a real articulation, except in the subfamily *Aphidiinæ*, between the second and third abdominal segments. From the *Evaniidæ* and the *Stephanidæ* they may be readily distinguished by the absence of a distinct costal cell in the front wings and by cephalic and abdominal peculiarities. The group, through the subfamily *Spathiinæ* and the *Stephanidæ*, is connected with the *Oryssidæ*, and will account for the arrangement of the subfamilies in this work.

Fifteen distinct subfamilies have been recognized, arranged, and tabulated, as follows:

TABLE OF SUBFAMILIES.

Clypeus emarginate or impressed anteriorly, forming with the mandibles a semicircular opening; articulation between segments 2 and 3 rigid, connate.. 12

Clypeus *not* emarginate or impressed anteriorly, the mandibles when closed fitting close to it and leaving *no* semicircular opening; very rarely with a slight opening in some *Opiinæ*.

Head with the cheeks rarely margined, the temples and the occiput always *immargined* 8

Head with the cheeks, temples, and the occiput *margined*.

Abdomen *not* distinctly segmented, without sutures, or at most with 2 or 3 superficial sutures, the dorsum convex, the venter usually strongly concave; spiracles of first segment rounded, placed very near the base.. 7

Abdomen normal, with the usual sutures 2

2. Abdomen sessile, the spiracles of first segment placed much *before* the middle. 5

Abdomen petiolate or petioliform, the spiracles placed *at* or a little *behind* the middle.

Subdiscoidal nervure in front wings originating from the base of the discoidal nervure, or at least *below* its middle; all abdominal segments *not* flexible 3

Subdiscoidal nervure usually interstitial or originating *above* the middle of the discoidal nervure; all abdominal segments flexible.

Subfamily I. APHIDIINÆ.

3. Front wings with *three* cubital cells 4

Front wings with *two* cubital cells or less.

Stigma very long and narrow, lanceolate; marginal cell acutely pointed at apex, the submedian cell shorter than the median; hind coxæ very long and slender; abdomen inserted high up on the metathorax.

Subfamily II. PAXYLOMMINÆ.

Stigma large, broad, oblong, or subovate; marginal cell most frequently very short, sometimes absent, the submedian cell as long or longer than the median; hind coxæ normal; abdomen inserted normally.

Subfamily III. EUPHORINÆ.

4. Stigma large, broad, subtriangular; second cubital cell wider than long or subquadrate; mesonotal furrows, as a rule, shallow, *not* deeply or sharply impressed, and converging and meeting in a depression before attaining the base of the scutellum; tibial spurs distinct, but not especially long.

Subfamily IV. METEORINÆ.

5. Front wings with *two* cubital cells.......... 6

Front wings with *three* cubital cells; anal cell most frequently divided by a transverse nervure or a stump of a nervure.

Head small, transverse, the temples narrow or flat; abdomen elongate and slender, the sides parallel or nearly, or somewhat strongly compressed, usually longer than the head and thorax united; tibial spurs *not* short, long or very long..........Subfamily V. MACROCENTRINÆ.

Head usually large, quadrate or subquadrate, the temples broad; abdomen rarely much longer than the head and thorax united, most frequently shorter, ovate or oval; tibial spurs short, stout.

Subfamily VI. HELCONINÆ.

6. Mesonotum, except in *Centistes* Haliday, with sharply defined parapsidal furrows, the furrows usually punctate and converging and uniting *at* or before attaining the base of the scutellum; tibial spurs either well developed or short; hind coxæ large, much larger than the anterior and middle pairs..........Subfamily VII. BLACINÆ.

7. Front wings with *two* cubital cells .... Subfamily VIII. SIGALPHINÆ.

Front wings with *three* cubital cells .... Subfamily IX. CHELONINÆ.

8. Hind wings most frequently with two marginal cells and often with a discoidal cell; if with only one marginal cell, the marginal cell in the front wings is wanting or incomplete, or at most feebly indicated; mesonotum with or without furrows; subdiscoidal nervure in hind wings never present, the median cell usually more or less contracted at the middle 10

Hind wings with only one marginal cell, the radius most frequently wanting; mesonotal furrows usually complete; marginal cell in front wings always present.

Hind wings always *without* a subdiscoidal nervure and without a discoidal cell 11

Hind wings *with* a more or less distinct subdiscoidal nervure and also frequently with a discoidal cell 9

9. Thorax with distinct and complete parapsidal furrows which converge and meet before the base of the scutellum and then extend as a single furrow to the scutellar fovea; marginal cell usually very narrow, pointed.
Subfamily X. AGATHIDINÆ.

10. Mesonotum *with* distinct and complete parapsidal furrows which converge and meet a little before attaining the base of the scutellum, but which do not extend to the scutellar fovea; front wings with *three* cubital cells, the second very large, as long or longer than the first; marginal cell complete, the second abscissa of the radius reclivate and extending to the apex of the wing .... Subfamily XI. CARDIOCHILINÆ.

Mesonotum *without* parapsidal furrows; front wings with *two* or *three* submarginal cells, rarely with only one, the second always small, triangular or subquadrate, often open behind; marginal cell most frequently wanting or incomplete, very rarely complete .. Subfamily XII. MICROGASTERINÆ.

11. Front wings with the anal cell divided by a transverse nervure or a stump of a vein, the marginal cell very short; hind wings *without* a recurrent nervure, the radius usually present .... Subfamily XIII. ICHNEUTINÆ.

Front wings with the anal cell *not* divided by a transeverse nervure, the marginal cell long, never very short; hind wings with the recurrent nervure sometimes present, the radius most frequently wanting.
Subfamily XIV. OPIINÆ.

12. Head posteriorly with the occiput, temples and cheeks *immargined;* hind wings with the submedian cell very short, the recurrent nervure always absent 13

Head posteriorly with the occiput, temples and cheeks *margined* (very rarely with the cheeks immargined); hind wings with the submedian cell *not* very short, the recurrent nervure most frequently present.......... 14

13. Front wings with *three* cubital cells, the subdiscoidal nervure originating *below* the middle of the discoidal nervure .... Subfamily XV. BRACONINÆ.

14. Front wings with the subdiscoidal nervure never interstitial and always originating *below* the middle of the discoidal nervure; mesonotal furrows usually present and extending to the base of the scutellum, or very near it; hind tibial spurs *not* very short; apterous forms occasionally.
Subfamily XVI. RHOGADINÆ.

Front wings with the subdiscoidal nervure *interstitial* or originating *above* the middle of the discoidal nervure; mesonotal furrows usually converging and uniting before attaining the scutellum, frequently arcuate or wanting; all tibial spurs minute; apterous or subapterous forms rare.
Subfamily XVII. SPATHIINÆ.

Subfamily I. APHIDIINÆ.

1838. *Aphidiidæ*, Family V, Haliday, Ent. Mag., V, p. 4.
1839. *Ichneumonidæ*, Family VI (part), Haliday, Hym. Synop., p. ii.
1840. *Flexiliventres*, Div. VI, Westwood, Intro. Mod. Class. Ins., II, Synop., p. 65.
1862. *Aphidioidæ*, Family IV, Förster, Verh. d. naturh. Ver. pr. Rheinl., XIX, pp. 228 and 247.
1885. *Aphidiides* Marshall, Trans. Ent. Soc. Lond., p. 10.
1887. *Aphidiinæ* Cresson, Syn. Hym. North America, pp. 54 and 63.
1888. *Aphidiidæ*, Tribe XXV, Marshall, Species des Hym. des Braconides, I, p. 67.
1900. *Aphidiinæ*, Subfamily I, Ashmead, Smith's Insects of New Jersey, p. 586.

Following the views of most writers on the *Braconidæ*, I have here included this group among the genuine Braconids as a subfamily, although I am much inclined to agree with Haliday, and treat it as of family rank equivalent to the *Alyssiidæ*, since the flexibility of the abdomen is quite characteristic and found in no other group. The species, in habitus, recall some of the small species of genuine Ichneumonids found in the subfamily *Ophioninæ*.

The species are susceptible of tribal division as follows:

TABLE OF TRIBES.

Hind wings *with* a basal nervure, the median cell complete, or at least indicated by hyaline veins..Tribe I. Aphidiini.
Hind wings *without* a basal nervure, the median cell incomplete or entirely absent. Tribe II. Trioxini.

Tribe I. APHIDIINI.

This tribe is here defined for the first time, and is readily recognized by the hind wings having a distinct basal nervure, the median cell complete.

Nine genera fall into this tribe, distinguishable as follows:

TABLE OF GENERA.

First discoidal cell complete, separated from the second cubital cell, the first abscissa of the cubitus present.. 2
First discoidal cell confused with the first cubital cell or *not* existing, the first abscissa of the cubitus wanting.................................. 3
2. Front wings with *three* cubital cells.
  Mesonotal furrows complete, antennæ more than 11-jointed; abdomen rounded, subpetiolate..........................(889) *Toxares* Haliday.
  Mesonotal furrows incomplete, wanting posteriorly; antennæ in both sexes 11-jointed; abdomen lanceolate ....(890) *Ephedrus* Haliday.
 Front wings with one cubital cell.........................(891) *Praon* Haliday.
3. First discoidal and first cubital cells confluent, but closed at apex by the recurrent nervure and the transverse cubitus uniting, the disco-cubital cell therefore present.. 4
 First discoidal and first cubital cells absent; no disco-cubital cell............ 6
4. Recurrent nervure strongly curved, not forming a straight line with the transverse cubital nervure; abdomen lanceolate.......................... 5

Recurrent nervure straight, *not* curved, and forming a straight line with the transverse cubital nervure; abdomen rounded.
(892) *Monoctonus* Haliday.

5. Metathorax much hump-shaped .... (893) *Cœlonotus* Förster.
Metathorax normal.
Radius much elongated, inclosing more than two-thirds of the marginal cell .... (894) *Aclitus* Förster.
Radius abbreviated, inclosing scarcely one-third of the marginal cell.
(895) *Aphidius* Nees.

6. Second discoidal cell present, complete.
Head transverse, the temples narrow; subdiscoidal nervure originating *above* the middle of the discoidal nervure .... (896) *Diæretus* Förster.
Head oblong, the temples broad, full; subdiscoidal nervure originating from the middle of the discoidal nervure..... (897) *Dyscritus* Marshall.

Tribe II. TRIOXINI.

The species falling in this tribe have *no* basal nervure in the hind wings, and the venation of the front wings is less developed, the cubital cells and most of the discoidal cells being absent.

Seven genera have been characterized, as follows:

TABLE OF GENERA.

Radius or marginal vein *not* entirely absent 2
Radius or marginal vein entirely absent.................. (898) *Paralipsis* Förster.

2. Transverse cubital nervure in front wings absent.............................. 3
Transverse cubital nervure in front wings present.... (899) *Lysiphlebus* Förster.

3. Second discoidal cell entirely absent or incomplete.............................. 4
Second discoidal cell distinct.
Postmarginal vein longer than the radius; female abdomen *without* prongs at apex .... (900) *Lipolexis* Förster.
Postmarginal vein shorter than the radius; female abdomen *with* prongs at apex .... (901) *Trioxys* Haliday.

4. Submedian cell *not* closed at apex, confluent with the second discoidal cell, the transverse median nervure absent.
Post-marginal vein shorter than the radius in both sexes; female *with* horn-like appendages or prongs at tip of abdomen.... (901) *Trioxys* Haliday.
Post-marginal vein longer than the radius; female *without* prongs at tip of abdomen .... (900) *Lipolexis* Förster.
Submedian cell closed at apex, the transverse median nervure distinct; second discoidal cell entirely absent................ (902) *Adialytus* Förster.

Subfamily II. PAXYLOMMINÆ.

1862. *Pachylommatoidæ*, Family XIII, FÖRSTER, Verh. d. naturh. Ver. pr. Rheinl., XIX, pp. 228 and 247.
1894. *Pachylommatinæ*, Subfamily, ASHMEAD, Proc. Ent. Soc. Wash., III, p. 54.
1896. *Pachylommaninæ* SZÉPLIGETI, Termes. Füzetek, XIX, p. 310.

This group is of small extent, and on account of the peculiar shape of the head, the venation of the wings, and its abdominal peculiarities is probably one of the most remarkable groups in the family *Braconidæ*.

By many authorities it was formerly included in the family *Evaniidæ*, although it has not a single character in common with any now placed in that family. The abdomen is attached somewhat above the insertion of the hind coxæ, but *not* on the dorsum of the metathorax, has a distinct ventral fold, and so far as the flexibility of the segments is concerned, as well as in its thoracic characters, comes nearest to the *Aphidiidæ*.

In other characters it resembles certain Ichneumonids belonging to the subfamily *Ophioninæ*. The clypeus is prominent, subrostriform, with two large, deep spiracles; the antennæ are 13-jointed, the scape and pedicel being subglobose, and equal or nearly in size; the front wings have a large, lanceolate stigma, two cubital cells, and a long, narrow, acutely pointed marginal cell; the hind coxæ are very long and almost cylindrical, while the abdomen is longly petiolated.

The tribe is based upon the genus *Paxylomma* De Brébisson, changed by Förster to *Pachylomma*. I do not believe anyone has the right to change a generic name, whether correctly or incorrectly formed, and I here restore the original spelling and call the group *Paxylomminæ*.

Three genera have been recognized, as follows:

TABLE OF GENERA.

First joint of hind tarsi scarcely one-third longer than the four following joints united, or of an equal length 2
First joint of hind tarsi twice as long as the four following joints united.......... 3
2. Second cubital cell longly petiolated, the radius divided into three abscissæ.
(903) *Paxylomma* De Brébisson=*Pachylomma* Förster.
Second cubital cell sessile, or at the most subsessile, the radius divided into two abscissæ..........(904) *Eupachylomma* Ashmead.
3. Second cubital cell sessile, the radius divided into two abscissæ.
(905) *Eurypterna* Förster.

Subfamily III. EUPHORINÆ.

1862. *Euphoroidæ*, Family 15, FÖRSTER, Verh. d. naturh. Ver. pr. Rheinl., XIX, pp. 228 and 250.
1885. *Euphorides* MARSHALL, Trans. Ent. Soc. Lond., p. 10.
1887. *Euphorinæ*, Subfamily, CRESSON, Syn. Hym. North Amer., pp. 54 and 55.
1888. *Euphoridæ*, Tribe XIII, MARSHALL, Species des Hym. des Braconides, I, p. 66.
1900. *Euphorinæ*, Subfamily III, ASHMEAD, Smith's Insects of New Jersey, p. 588.

In having a distinctly petiolated abdomen this subfamily agrees with both the *Paxylomminæ* and the *Meteorinæ*. From the former it is separated by the venation of the front wings, the large and broad stigma, and usually by the short marginal cell. The marginal cell is sometimes long, but is broader and entirely different from that in the *Paxylomminæ;* the coxæ are normal, never long, cylindrical, while the abdomen is attached normally. From the *Meteorinæ* it is distinguished by having at the most but two cubital cells.

TABLE OF GENERA.

First cubital and first discoidal cells confluent, *not* separated, the first abscissa of the cubitus absent.. 2

First cubital and first discoidal cells distinctly separated, the first abscissa of the cubitus present.. 6

2. Head abnormal, *with* a prominent bilobed frontal ledge, each lobe with a small tubercle within.. 5

Head normal, *without* a prominent frontal ledge.................................. 3

3. First joint of antennæ normal, not elongate.................................. 4

First joint of antennæ abnormal, much elongate.

Antennæ 16-jointed, joints 2 and 3 much elongate, the scape not longly hairy beneath ....(906) *Streblocera* Westwood.

Antennæ 18-jointed, joints 2 and 3 not much elongate, the scape longly hairy beneath..............................(907) *Eutanycerus* Förster.

4. Marginal cell *not* elongate, but shortened, never longer than the stigma, often shorter; maxillary palpi 6-jointed.

(908) *Perilitus* Nees = *Microctonus* Förster *nec* Wesmael.

Marginal cell elongate, extending to the tip of the wing, or nearly, always much longer than the stigma.. (909) *Microctonus* Wesmael=*Syntretus* Förster.

5. Marginal cell longer than the large stigma, the second discoidal cell incomplete; ovipositor prominent....................(910) *Cosmophorus* Ratzeburg.

6. Antennæ more than 10-jointed, *not* clavate 7

Antennæ 10-jointed, geniculate clavate; joints 1 and 3 elongate.

(911) *Eustalocerus* Förster=*Rhopalophorus* Haliday.

7. Petiole of abdomen normal, *not* greatly elongate.......................... 8

Petiole of abdomen greatly elongate.

(912) *Wesmælia* Förster=*Gamosecus* Provancher.

8. Mesothoracic furrows distinct, complete.................................. 9

Mesothoracic furrows entirely absent or at the most only indicated anteriorly. 10

9. Transverse cubitus always emerging from the distinctly elongate first abscissa of the radius; marginal or radial cell ample, pointed at apex; ovipositor prominent.

Metathorax distinctly areolated; head nearly cubical; eyes normal; hind coxæ *not* elongate ....(913) *Dinocampus* Förster.

Metathorax *not* areolated; head transverse, viewed from in front short, wider than long; eyes very large; hind coxæ elongate.

(914) *Myiocephalus* Marshall=*Loxocephalus* Förster.

Transverse cubitus emerging either direct from the stigma or from the very short first abscissa of the radius; marginal cell very short.

(915) *Peristenus* Förster.

10. First and second discoidal cells absent or incomplete; at most with only the cubitus present.. 11

First and second discoidal cells present, distinct.

Marginal cell *long*, extending to the tip of the wing; posterior face of metathorax areolated.............(916) *Euphoridea* Ashmead, new genus.

(Type, *Euphoridea claripennis* Ashmead, manuscript.)

Marginal cell *very short*, shorter or no longer than the stigma; metathorax exareolated; maxillary palpi 5-jointed...........(917) *Euphorus* Nees.

11. Marginal cell obliterated..............(918) *Euphoriella* Ashmead, new genus.

(Type, *Labeo incertus* Ashmead.)

Subfamily IV. METEORINÆ.

1862. *Perilitoidæ*, Family 16, FÖRSTER, Verh. d. naturh. pr. Rheinl., XIX, pp. 228, 253.
1885. *Perilitides* MARSHALL, Trans. Ent. Soc. Lond., p. 10.
1887. *Meteorinæ*, Subfamily CRESSON, Syn. Hym. North America, pp. 55 and 60.
1888. *Meteoridæ*, Tribe XIV, Species des Hym. des Braconides, I, p. 66.
1900. *Meteorinæ*, Subfamily IV, ASHMEAD, Smith's Insects of New Jersey, p. 588.

This group was at one time confused with the *Euphorinæ*, but may be easily separated by the venation of the front wings; all the species falling in it having *three* distinct cubital cells, never less.

Many of the species also bear a superficial resemblance to some in the next subfamily, or the *Macrocentrinæ*, and the greatest attention must be given to the abdominal characters before they can be separated.

TABLE OF GENERA.

Hind wings with the marginal cell normal, not widened toward apex and not divided by a transverse nervure.. 2
Hind wings with the marginal cell broadened toward apex and divided by a more or less distinct transverse nervure.
Hind tarsi usually white...............................(919) *Zemiotus* Förster.
2. Front wings with the transverse median nervure either interstitial with the basal nervure or jointing the median vein *beyond* it, the submedian cell therefore as long or longer than the median.................. 3
Front wings with the transverse median nervure joining the median vein *before* the origin of the basal nervure, the submedian cell therefore shorter than the median ....(920) *Protelus* Förster.
3. First abscissa of the radius much longer than the second; petiole of abdomen long and slender, of a uniform thickness throughout................ 4
First abscissa of the radius always shorter than the second; petiole of abdomen neither especially long nor slender, widened at apex.
(921) *Meteorus* Haliday=*Perilitus* Förster.
4. Mesonotal furrows distinct; first cubital cell *not* confluent with the first discoidal cell....................................(922) *Sapotrichus* Holmgren.
Mesonotal furrows wanting; first cubital cell confluent with the first discoidal cell.......................................(923) *Aridelus* Marshall.

Subfamily V. MACROCENTRINÆ.

1862. *Macrocentroidæ*, Family 22, FÖRSTER, Verh. d. naturh. Ver. pr. Rheinl., XIX, pp. 229 and 256.
1885. *Macrocentrides* MARSHALL, Trans. Ent. Soc. Lond., p. 10.
1887. *Macrocentrinæ*, Subfamily, CRESSON, Syn. Hym. North America, p. 61.
1888. *Macrocentridæ* MARSHALL, Species des Hym. des Braconides, I, p. 67.
1900. *Macrocentrinæ*, Subfamily V, ASHMEAD, Smith's Insects of New Jersey, p. 589.

Distinguished from the *Euphorinæ* by the elongate, *sessile*, not petiolate, abdomen, and from the *Helconinæ* by the characters made use of in my table of subfamilies.

Two tribes have been recognized.

TABLE OF TRIBES.

Hind tibial spurs very *short*, much less than half the length of the basal joint of tarsi; ovipositor very long, longer than body ....Tribe I. MACROCENTRINI.

Hind tibial spurs very *long*, the inner spur being half as long as the basal joint of tarsi (or even longer); ovipositor short, usually much shorter than the abdomen. Tribe II. ZELINI.

Tribe I. MACROCENTRINI.

The totally different shape of the abdomen, the longer ovipositor, and the very short hind tibial spurs, readily distinguish this tribe.

Five genera have been recognized, one—the first—being found only in Africa; the others in the European and American faunæ.

TABLE OF GENERA.

Radius with only two abscissæ 5

Radius with three abscissæ.

Palpi very long; second joint of hind trochanters usually crowned with minute spines 2

Palpi much shorter; second joint of hind trochanters normal, without minute spines 4

2. Median and submedian veins normal, the marginal cell not abnormally large, the radius not extended to apex of the wings.......................... 3

Median and submedian veins incrassated before the transverse median nervure, the marginal cell abnormally large, the radius extending to the apex of the wing; first discoidal cell petiolate. (Africa.)
(924) *Dicranoneura* Kriechbaumer.

3. Submedian cell in front wings *not* longer than the median, the transverse median nervure interstitial 4

Submedian cell in front wings always longer than the median.

First discoidal cell sessile; radius in the hind wings distinct.
(925) *Macrocentrus* Curtis.

First discoidal cell petiolate; radius in the hind wings absent.
(926) *Amicoplidea* Ashmead, new genus.
(Type, *Zele pallidiventris* Provancher.)

4. First discoidal cell sessile; second cubital cell scarcely half as wide at apex as at base; radius in the hind wings distinct ...... (927) *Amicoplus* Förster.

5. The second cubital cell triangular; median and submedian cells of an equal length .... (928) *Microtypus* Ratzeburg.

Tribe II. ZELINI.

The very much longer hind tibial spurs, the compressed or subcompressed abdomen, and the short ovipositor readily distinguish this tribe.

The compressed shape of the abdomen cause these insects to be frequently mistaken for Ophionines, in the tribe *Paniscini*, although the venation is quite distinct. I often find our larger species, belonging to the genus *Zele*, confused in collections with *Paniscus*.

TABLE OF GENERA.

Hind wings with the marginal cell normal, *not* divided by a transverse nervure.
Marginal cell long and narrow, lanceolate; second cubital cell subquadrate, slightly narrowed above, subsessile with the stigma, the first abscissa of the radius scarcely developed; claws cleft. (Africa.)
(929) *Neophylax* Ashmead, new genus.
(Type, *Neophylax snyderi* Ashmead, manuscript.)
Marginal cell normal, not much narrowed; second cubital cell longer than wide, petiolate, the first abscissa of the radius distinct; claws simple.
(930) *Zele* Haliday.
Hind wings with the marginal cell divided into two cells by a transverse nervure.
(931) *Homolobus* Förster.

Subfamily VI. HELCONINÆ.

1862. *Helconoidæ*, Family 21, Förster, Verh. d. naturh. Ver. pr. Rheinl., XIX, pp. 229 and 255.
1885. *Helcontide* Marshall (part), Trans. Ent. Soc. Lond., p. 10.
1887. *Helconinæ*, Subfamily Cresson (part), Syn. Hym. N. A., pp. 54, 55, and 61.
1888. *Helcontidæ*, Tribe XIX, Marshall (part), Species des Hym. des Braconides, I, p. 67.
1900. *Helconinæ*, Subfamily VI, Ashmead Smith's Insects of New Jersey, p. 590.

This subfamily is allied to the *Macrocentrinæ*, but is easily separated by the larger, more quadrate head, the temples being broad, not narrow or flat, by the shape of the abdomen, and by the short, stout, tibial spurs, which are quite characteristic and very distinct from those found in the subfamily *Macrocentrinæ*.

In it is included the singular genus *Cenocœlius* Haliday, at one time classified with the *Evaniidæ*, on account of the abdomen being attached high up on the posterior truncature of the metathorax, as in *Evania*. It is, however, a true Braconid in all other characters, venation of front and hind wings, and in its economy.

Two tribes are recognized, as follows:

TABLE OF TRIBES.

Head with a deep frontal excavation above the insertion of the antennæ, the front ocellus placed in the excavation; abdomen most frequently longer than the head and thorax united, rarely shorter; posterior femora usually somewhat incrassated and often armed with a tooth, or teeth, beneath...... Tribe I. Helconini.
Head at the most with a shallow frontal excavation, the front ocelli *not* placed in the depression; abdomen not as long as the head and thorax united, oblong-oval or ovate; posterior femora rarely much incrassated, and always simple, unarmed.
Tribe II. Diospilini.

Tribe I. HELCONINI.

This tribe represents Förster's family *Helconoidæ*, or Marshall's tribe *Helcontides*, and is readily distinguished by the characters pointed out above, the frontal excavation, the position of the front ocellus being characteristic.

The group, taken as a whole, attack wood-boring coleopterous larvæ.

Seven genera belong to the tribe, two of which are found in the Tropics.

TABLE OF GENERA.

Abdomen attached to the metathorax normally 2
Abdomen attached to the metathorax far *above* the hind coxæ 7
2. Hind femora beneath with one or more teeth 3
Hind femora beneath simple, unarmed 4
3. Hind femora beneath armed with many small teeth; recurrent nervure joining the second cubital cell .... (932) *Euscelinus* Westwood.
Hind femora beneath armed with one tooth; recurrent nervure joining the first cubital cell .... (933) *Helcon* Nees.
4. Recurrent nervure joining the first cubital cell.
Second cubital cell *longer* than wide; clypeus at apex truncate 5
Second cubital cell *not* longer than wide; clypeus at apex rounded 6
5. Basal joint of hind tarsi *not* longer than joints 2–4 united; median cell in hind wings not shorter than the costal cell...... (934) *Gymnoscelis* Förster.
Basal joint of hind tarsi longer than joints 2–4 united; median cell in hind wings much shorter than the costal cell.
(935) *Eumacrocentrus* Ashmead, new genus.
(Type, *Gymnoscelis americana* Cresson.)
6. Submedian and median cells of an equal length; second cubital cell petiolate and a little shorter along the radius than along the cubitus.
(936) *Aspicolpus* Wesmael.
Submedian cell distinctly longer than the median; second cubital cell sessile or subsessile, longer along the radius than along the cubitus.
(937) *Schauinslandia* Ashmead, new genus.
(Type, *Schauinslandia femorata* Ashmead, manuscript.)
7. Recurrent nervure interstitial or joining the first cubital cell; first discoidal cell largely petiolate; second cubital cell not large.
(938) *Cenocœlius* Haliday.

Tribe II. DIOSPILINI.

1862. *Diospiloidæ*, Family 23, Förster, Verh. d. naturh. Ver. pr. Rheinl., XIX, pp. 229 and 257.
1887. *Diospilinæ*, Subfamily, Cresson, Syn. Hym. North America, p. 61.
1888. *Diospilidæ*, Tribe XXI, Marshall, Species des Hym. des Braconides, I, p. 67.

This tribe is usually treated as a distinct subfamily, as the bibliography shows, but it is too closely allied to the genuine Helconines to retain such a rank and it is here reduced to tribal value. It is scarcely separable from the *Helconini*, and I should not be surprised to find that the characters I have used to separate it from that tribe will prove valueless with new discoveries.

The Rev. T. A. Marshall treats *Taphœus* Wesmael as a synonym of *Diospilus* Haliday, but I agree with Thomson in believing both good genera.

TABLE OF GENERA.

First discoidal cell *not* petiolate, touching the parastigma........................ 2
First discoidal cell petiolate, remote from the parastigma 4
2. Clypeus anteriorly truncate, or very slightly rounded; four terminal joints in male antennæ *not* thicker than the preceding........................ 3
Clypeus anteriorly pointed medially, with a large deep fovea on each side; four terminal points in male antennæ thicker than the preceding.
(939) *Aspigonus* Wesmael.
3. Submedian and median cells equal; second cubital cell narrowed above; thorax fully thrice as long as wide....................(940) *Diospilus* Haliday.
Submedian cell longer than the median; second cubital cell quadrate; thorax about twice as long as wide..................(941) *Taphæus* Wesmael.
4. Second cubital cell either quadrangular or subquadrate, *not* small, rarely confluent with the first.
First and second cubital cells distinct, *not* confluent.................. 5
First and second cubital cells more or less confluent.
(942) *Anostenus* Förster.
5. Metanotum completely areolated; first abdominal segment striate; hind wings with the recurrent nervure distinct..............(943) *Dolops* Marshall.
Metanotum *not*, or very obsoletely, areolated.
Metanotum *not* elongate; first and second abdominal segments smooth; recurrent nervure in hind wings wanting...(944) *Dyscoletes* Westwood.
Metanotum elongate; first and second abdominal segments striate.
(945) *Leluthia* Cameron.

Subfamily VII. BLACINÆ.

1862. *Blacoidæ*, Family 18, FÖRSTER, Verh. d. naturh. Ver. pr. Rheinl., XIX, pp. 229 and 254.
1885. *Blacides* MARSHALL, Trans. Ent. Soc. Lond., p. 10.
1887. *Blacinæ*, Subfamily, CRESSON, Syn. Hym. North America, p. 54.
1888. *Blacidæ*, Tribe XVI, MARSHALL (part), Species des Hym. des Braconides, I., p. 16.
1900. *Blacinæ*, Subfamily VII, ASHMEAD, Smith's Insects of New Jersey, p. 590.

This subfamily is also treated somewhat differently from Förster and Marshall, since I have included as components of it groups placed elsewhere by these authors—the so-called *Calyptinæ* and the genus *Orgilus* Haliday, the latter having heretofore been considered a component of the *Agathidinæ*.

Both, however, have very little affinity with the *Agathidinæ*, and are in every way much more closely allied to the *Helconinæ*, from which they are separated by having only *two* cubital cells in the front wings; otherwise they are identical.

The three tribes recognized in this subfamily are characterized in the table below:

TABLE OF TRIBES.

Front wings with the second discoidal cell completely closed at apex, and most frequently, but not always, *with* the anal cell divided by one or more transverse nervures or stumps of nervures; first abscissa of radius oblique 2
Front wings with the second discoidal cell open at apex, the anal cell *not* divided by

transverse nervures or stumps of nervures; first abscissa of the radius straight, perpendicular, forming with the second an acute right angle. Tribe I. BLACINI.

2. Second abscissa of radius straight, *not* at all arcuate and forming with the transverse cubitus almost a straight line; tibial spurs long; anal cell *not* divided. Tribe II. ORGILINI.

Second abscissa of radius *always* more or less arcuate or curving slightly upwards and never forming a straight line with the transverse cubitus; tibial spurs short; anal cell most frequently divided or with traces of stumps of veins, rarely normal ....Tribe III. CALYPTINI.

Tribe I. BLACINI.

1900. *Blacini*, Tribe III, ASHMEAD, Smith's Insects of New Jersey, p. 590.

The species falling in this tribe always have the second discoidal cell open at the apex, the first abscissa of the radius is straight or perpendicular and forms an acute angle with the second abscissa, while the anal cell is never divided by a transverse nervure, the submedian vein being without a trace of such a nervure.

Five genera may be distinguished in this group, as follows:

TABLE OF GENERA.

First discoidal cell sessile, the cubitus emerging from the parastigma.............. 2

First discoidal cell petiolate, the cubitus emerging from the basal nervure. (946) *Pygostolus* Haliday.

2. Metathorax normal, the scutellum rounded or obtuse at apex, never toothed. 3

Metathorax with a very obtuse angular ridge toward apex, the hind angles of the posterior face toothed; scutellum triangular in male, acutely toothed at apex..................................(947) *Goniocormus* Förster.

3. Submedian cell always much longer than the median.

First cubital and first discoidal cells distinctly separated.................... 4

First cubital and first discoidal cells confluent, the first abscissa of the cubitus absent ....(948) *Neoblacus* Ashmead, new genus. (Type, *Neoblacus rufipes* Ashmead, manuscript.)

4. Female antennæ at the most 17-jointed, in male 19-jointed; subdiscoidal nervure forming a curve with the discoidal nervure........(949) *Blacus* Nies.

Female antennæ more than 17-jointed, in male more than 19-jointed; subdiscoidal nervure forming an obtuse angle with the discoidal nervure. (950) *Ganychorus* Haliday.

Tribe II. ORGILINI.

1900. *Orgilini*, Tribe II, Ashmead, Smith's Insects of New Jersey, p. 590.

This tribe is based upon the genus *Orgilus* Haliday, which, by all other recent writers, has always been placed in the subfamily *Agathidinæ*, where it is clearly a disturbing element, its relation to these insects being merely superficial.

The genus clearly belongs in this group and comes nearest to the genus *Eubadizon*, with which Hartig united it as early as 1837.

The *Orgilini* are distinguished from the *Calyptini* by the straightness of the second abscissa of the radius, which is never arcuate, as in the latter tribe, by the absence of any trace of a dividing nervure in the anal cell and by the longer tibial spurs.

Four genera are placed in the tribe, as follows:

TABLE OF GENERA.

Marginal cell neither large nor extending to tip of the wing, the radius reaching the costal margin much before the tip 2

Marginal cell large, extending to the tip of the wing.
(951) *Hymenochaonia* Dalle Torre.

2. First abscissa of the radius much shorter than the transverse cubitus, the marginal cell *not* very broad at base; subdiscoidal nervure originating usually *below* the basal third of the discoidal nervure 3

First abscissa of the radius long, nearly as long as the transverse cubitus, the marginal cell therefore very broad at base; subdiscoidal nervure originating from the basal third of the discoidal nervure.
(952) *Oresimus* Ashmead, new genus.
(Type, *Eubadizon maculiventris* Cresson.)

3. Submedian cell *not* longer than the median, equal or a little shorter, the transverse median nervure *interstitial* or nearly with the basal nervure.
(953) *Orgilomorpha* Ashmead, new genus.
(Type, *Ganychorus gelichiæ* Ashmead.)

Submedian cell usually somewhat longer than the median, the transverse median nervure uniting with the median vein *beyond* the origin of the basal nervure .... (954) *Orgilus* Haliday.

Tribe III. CALYPTINI.

1862. *Brachistoidæ*, Family 17, FÖRSTER, Verh. d. naturh. Ver. pr. Rheinl., XIX, pp. 229 and 253.

1862. *Liophronoidæ*, Family 19, FÖRSTER, Verh. d. naturh. Ver. pr. Rheinl., XIX, pp. 229 and 254.

1885. *Cryptides* MARSHALL, Trans. Ent. Soc. Lond., p. 10.

1887. *Calyptinæ*, Subfamily CRESSON, Syn. Hym. North America, pp. 54–55.

1900. *Calyptini*, Tribe I, ASHMEAD, Smith's Insects of New Jersey, p. 590.

This tribe is distinguished from the former by the second abscissa of the radius being always more or less arcuate, never straight, and never forming a straight line with the transverse cubitus; by the anal cell being most frequently divided by transverse nervures or traces of nervures, rarely normal; and by the short tibial spurs.

The group is closest allied to the next, or the *Sigalphinæ* through the genus *Calyptus* Haliday.

There has been the greatest confusion in regard to some of the names of the genera placed in this group and I am by no means satisfied that I have correctly identified the genera.

Nees's original description of *Leiophron* could apply only to a form similar to *Centistes* Haliday, although he afterwards included other forms. Förster's conception of this genus was, therefore, evidently correct and may yet prevail.

The species placed in *Leiophron* by American students belong to the genus *Brachistes* Wesmael, as defined in my table.

Seven genera have been recognized, separable as follows:

TABLE OF GENERA.

Mesonotum *with* two distinct furrows 2
Mesonotum *without* furrows entire.
First discoidal cell petiolate; metanotum with a transverse apical carina.
(955) *Centistes* Haliday=*Liophron* Nees (Förster).
2. Abdomen with only three visible dorsal segments, the others, if present, retracted and invisible 6
Abdomen with more than three dorsal segments, usually 6 to 8 segments.
Anal cell in front wings *with* one or two transverse nervures or stumps of nervures between its base and apex 4
Anal cell in front wings *without* a trace of such nervures 3
3. First discoidal cell sessile, the cubitus originating from the base of the parastigma.
Abdomen elongate, longer than the head and thorax united, the sides parallel or nearly; first joint of flagellum *longer* than the scape and pedicel united, and a little longer than the second ......(956) *Eubadizon* Nees.
Abdomen oblong-oval, *not* or scarcely longer than the head and thorax united, the sides *not* parallel; first joint of the flagellum shorter than the scape and pedicel united, and *not* longer than the second.
(957) *Brachistes* Wesmael.
4. First cubital and first discoidal cells separated, the first abscissa of the cubitus never obliterated 5
First cubital and first discoidal cells *confluent*, the first abscissa of the cubitus wanting or obliterated ....(958) *Sirrhizus* Förster.
5. First abscissa of the radius *very* short, shorter than the transverse median nervure; second discoidal cell open at the lower apical angle.
(959) *Leiophron* Nees (Marshall) ? =*Ancylus* Haliday.
First abscissa of the radius *not* short, as long or longer than the transverse median nervure; second discoidal cell closed.
First abscissa of the radius distinctly longer than the transverse median nervure; first joint of the flagellum longer than the globose scape and pedical united; metanotum not longer than wide; abdomen not longer than the thorax, scarcely so long.
(960) *Allurus* Förster? =*Ancylocentrus* Förster? =*Liophron* Authors. (part).
First abscissa of the radius *not* longer than the transverse cubitus; first joint of the flagellum *not* longer than the scape and pedicel united, usually a little shorter; mesonotum longer than wide; abdomen as long as the head and thorax united, or at least longer than the thorax.
(961) *Brachistes* Wesmael=*Liophron* Authors. (part)=*Calyptus* Authors. (part).
6. Anal cell usually with a slight oblique nervure toward the base; metonotum with a short median carina connected with an apical transverse carina.
(962) *Calyptus* Haliday=*Brachistes* Wesmael (part).

Subfamily VIII. SIGALPHINÆ.

1818. *Bassi*, Family 11, NEES, Berl. Mag., VII, p. 243.
1818. *Sigalphi*, Family 1, NEES, Berl. Mag., VII, p. 247.
1862. *Sigalphoidæ*, Family 8, FÖRSTER, Verh. d. naturh. Ver. pr. Rheinl., XIX, pp. 228 and 242.
1885. *Sigalphides* MARSHALL, Trans. Ent. Soc. Lond., p. 10.
1887. *Sigalphinæ*, Subfamily, CRESSON, Syn. Hym. North America, pp. 55 and 58.

1888. *Sigalphidæ*, Tribe IX, MARSHALL, Species des Hym. des Braconides, I, p. 66.
1900. *Sigalphinæ*, Subfamily VIII, ASHMEAD, Smith's Insects of New Jersey, p. 591.

This subfamily, and the following, is remarkable for its abdominal peculiarities, the segments being connate, sometimes without any trace of sutures, or at most with two or three (rarely four) indistinct sutures, forming a carapace above, and deeply concave beneath.

The species belonging in this subfamily differ from the next, or the *Chelonineæ*, by having, at the most, only *two* cubital cells in the front wings; otherwise they are indistinguishable.

Försteria Szépligeti, I have not seen, but seems to differ from *Polydegmon* Förster only in having no tooth on the hind coxæ and in having the abdomen at apex entire.

Eight genera fall into this group:

TABLE OF GENERA.

Abdomen *not* segmented, composed of a single carapace 4
Abdomen composed of 3 visible segments 2
Abdomen with 5 visible segments, the fourth and fifth *not* entirely concealed.
  Marginal cell closed; anal cell *with* a transverse nervure; antennæ multiarticulate. (963) *Allodorus* Förster.
  Marginal cell open at apex; anal cell *without* a transverse nervure; antennæ 12-jointed .... (964) *Episigalphus* Ashmead, new genus.
  (Type, *Episigalphus minutessimus* Ashmead, manuscript.)
2. Marginal cell closed.
  Mesonotum *with* parapsidal furrows 3
  Mesonotum *without* parapsidal furrows, smooth, highly polished. (965) *Liosigalphus* Ashmead, new genus.
  (Type, *Liosigalphus politus* Ashmead, manuscript.)
3. Hind coxæ with a tooth above; second abdominal segment longer than the third, the transverse lines approaching the base laterally; hind margin of third segment notched.................. (966) *Polydegmon* Förster.
  Hind coxæ *without* a tooth above.
    Second abdominal segment shorter than the third, the transverse lines *not* approaching the base laterally; hind margin of third segment not notched; scutellum normal; head as wide as the thorax. (967) *Sigalphus* Latreelle.
    Second abdominal segment longer than the third.
      Scutellum normal; head as wide as the thorax. (968) *Försteria* Szépligeti.
      Scutellum bidentate; head small, narrower than the thorax. (969) *Fornicia* Brullé.
4. Transverse median nervure interstitial; first discoidal cell sessile; apex of abdomen with a deep median emargination, the ovipositor prominent; apex of male abdomen unarmed............... (970) *Schizoprymnus* Förster.
  Transverse median nervure *not* interstitial; first discoidal cell petiolate; apex of abdomen *without* or with only a slight emargination, the ovipositor prominent; apex of male abdomen usually armed with two spines or teeth.................................. (971) *Urosigalphus* Ashmead.

Subfamily IX. CHELONINÆ.

1818. *Cheloni*, Family 11, NEES, Berl. Mag., VII, p. 260.
1862. *Chelonoidæ*, Family 9, Verh. d. Naturh. Ver. pr. Rheinl., XIX, pp. 228 and 243.
1885. *Chelonides* MARSHALL, Trans. Ent. Soc. Lond., p. 10.
1887. *Cheloninæ*, Subfamily, CRESSON, Syn. Hym. North Amer., pp. 54–55.
1888. *Chelonidæ*, Tribe X, MARSHALL, Species des Hym. des Braconides, I, p. 66.
1900. *Cheloninæ*, Subfamily IX, ASHMEAD Smith's Insects of New Jersey, p. 591.

Allied to the *Sigalphinæ* and separated from them by having *three* cubital cells in the front wings; otherwise they are identical.

The tribe is represented by eight genera, all found in the United States, except *Trachypetus* Guérin, which is tropical.

All may be easily recognized by the use of the following table:

TABLE OF GENERA.

Wingless species 7
Winged.
  First cubital and first discoidal cells *separated*, not confluent; eyes bare 2
  First cubital and first discoidal cells *confluent*, the first abscissa of the cubitus absent or incomplete; abdomen not segmented; eyes hairy. (972) *Chelonus* Jurine.
2. Recurrent nervure joining the *first* cubital cell or interstitial with the first transverse cubitus 3
   Recurrent nervure joining the *second* cubital cell 4
3. Abdomen not segmented; first discoidal cell petiolate.
     Second cubital cell subtriangular, the second abscissa of the radius usually shorter than the first; submedian cell longer than the median; abdomen at apex not bidentate ....(973) *Ascogaster* Wesmael.
     Second cubital cell oblong-quadrate, the second abscissa of the radius at least three or four times longer than the first; submedian cell *not* longer than the median; abdomen at apex bidentate. (974) *Gastrotheca* Guérin.
   Abdomen 3-segmented; first discoidal cell sessile or subsessile. (975) *Phanerotoma* Wesmael.
4. Abdomen *not* elongate clavate, oval or oblong-oval, with from 3 to 4 segments.. 5
   Abdomen elongate clavate, with 2 segments, the first long, petioliform; antennæ very long, filiform, about twice the length of the body. (976) *Trachypetus* Guérin.
5. Abdomen normal, not tumid, the lateral margins of segments *not* extending over the sides beneath; ovipositor prominent or subexserted; clypeus *not* prominent 6
   Abdomen tumid, the lateral margins of the segments extending over the sides beneath; clypeus prominent; second cubital cell longer than wide. (977) *Sphaeropyx* Illiger.
6. Second cubital cell *wider* than long; joints 1 and 2 of maxillary palpi dilated, the last two very small, shorter than the second. (978) *Tetrasphaeropyx* Ashmead.
   Second cubital cell *longer* than wide; maxillary palpi normal, the last two joints elongate, as long or a little longer than the second. (979) *Acampsis* Wesmael.
7. Abdomen with 3 or 4 segments ....(979) *Acampsis* Wesmael.

Subfamily X. AGATHIDINÆ.

1885. *Agathides* Marshall, Trans. Ent. Soc. Lond., p. 10.
1887. *Agathinæ*, Subfamily Cresson, Syn. Hym. North America, pp. 54 and 59.
1888. *Agathididæ*, Tribe XII, Marshall, Species des Hym. des Braconides, I, p. 66.
1900. *Agathidinæ*, Subfamily X, Ashmead, Smith's Insects of New Jersey, p. 592.

This subfamily represents quite a distinct group, but with affinities allying it to the *Cardiochilinæ* and the *Microgasterinæ*, the three evidently having had a common origin.

The short, very narrow, pointed marginal cell is characteristic of the group, and this character, with the others given in my table of subfamilies, renders the group easily recognized.

Förster made of the group two distinct families, *Agathidoidæ* and *Eumicrodoidæ*, based merely upon a difference in the shape of the head.

I believe, with Mr. Marshall, that both groups are too closely allied to warrant such a separation; but since both groups may be easily separated by the character used by Förster, their separation is maintained as a matter of convenience, in the sense of tribes.

The groups are thus distinguished:

TABLE OF TRIBES.

Head rostriform, the malar space, or the space between the eyes and the mandibles, very long .... Tribe I. Agathidini.
Head normal, not rostriform, the malar space never very long, *sometimes* entirely wanting, the eyes extending to base of mandibles.......... Tribe II. Microdini.

Tribe I. AGATHIDINI.

1862. *Agathidoidæ*, Family II, Förster, Verh. d. Naturh. Ver. pr. Rheinl., XIX, pp. 228 and 245.
1900. *Agathidini*, Tribe I, Ashmead, Smith's Insects of New Jersey, p. 592.

The shape of the head alone must be depended upon to distinguish this tribe.

Six genera fall into this minor group, separable as follows:

TABLE OF GENERA.

Areolet present, never wholly wanting, triangular or quadrate.................... 2
Areolet wholly wanting ....(980) *Braunsia* Kriechbaumer.
2. Areolet triangular, often petiolate.. 5
Areolet quadrate, the outer nervure, or the second transverse cubitus, most frequently broken by a stump of a vein.............................. 3
3. Frontal excavation large, with a sharp edge on each side, not separated at the middle; between the antennæ at the base are two stout knobs.
Lateral edges of the frontal cavity *not* continued to the lateral ocelli; ovipositor long.. 4
Lateral edges of the frontal cavity extending to the lateral ocelli; ovipositor not very prominent..........................(981) *Disophrys* Förster.

4. Scape *not* long, scarcely more than twice as long as thick; legs normal. (982) *Cremnops* Förster.

Scape long, stout, fully three times as long as thick; legs, especially the hind pair, robust .... (983) *Megagathis* Kriechbaumer.

5. Frontal excavation not large, *without* a sharp edge on each side; no knobs between the antennæ.

Maxillary palpi in female abnormal, the three penultimate joints short, compressed, lenticular; claws cleft .... (984) *Troticus* Serville.

Maxillary palpi normal; claws simple .... (985) *Agathis* Latreille.

Tribe II. MICRODINI.

1862. *Eumicrodoidæ*, Family 12, FÖRTSTER, Verh. d. naturh. Ver. pr. Rheinl., XIX, pp. 228 and 246.

1900. *Microdini*, Tribe II, ASHMEAD, Smith's Insects of New Jersey, p. 592.

This tribe differs from the preceding in having a normally shaped head, and by the much shorter malar space, which is sometimes wholly wanting; otherwise the groups are identical.

Fifteen genera have been recognized, distinguishable as follows:

TABLE OF GENERA.

First cubital and first discoidal cells *separated*, never confluent, the first abscissa of the cubitus distinct 11

First cubital and first discoidal cells *confluent*, the first abscissa of the cubitus more or less completely obliterated.

Maxillary palpi 5 or 6 jointed 2

Maxillary palpi 4-jointed.

Areolet triangular; parapsidal furrows meeting at the middle of the mesonotum .... (986) *Cenostomus* Förster.

2. Labium *very* long and slender; maxillary palpi 6-jointed 3

Labium *not* very long 4

3. Labium extending to the middle of the mesonotum; mandibles falcate, *with* a small tooth within ... (987) *Agathirsia* Westwood=*Paragathis* Ashmead.

Labium *not* so long; mandibles falcate, edentate, acute at tips, *without* a tooth within .... (988) *Agathona* Westwood.

4. Maxillary palpi normal, 5-jointed, *not* much lengthened 5

Maxillary palpi abnormally lengthened, extending to the base of the abdomen. (989) *Aenigmostomus* Ashmead, new genus. (Type, *Microdus longipalpus* Cresson.)

5. Forms slender, elongate, the ovipositor always long 8

Forms rather stout, robust, the ovipositor very short or only slightly exserted. 6

6. Hind wings *without* a closed discoidal cell; inner spur of hind tibiæ about one-third the length of the basal joint of tarsi; second joint of maxillary palpi dilated or thickened; areolet triangular, subtrapezoidal or petiolate 7

Hind wings *with* a closed discoidal cell; inner spur of hind tibiæ longer than half the length of the basal joint of tarsi; palpi normal; areolet triangular, usually petiolate .... (990) *Crassomicrodus* Ashmead, new genus. (Type, *Microdus fulvescens* Cresson.)

7. Eyes normal, not nearly extending to the base of the mandibles, the malar space distinct, broad.

Areolet triangular, usually petiolate; claws simple.
(991) *Epimicrodus* Ashmead, new genus.
(Type, *Microdus diversus* Cresson.)

Areolet sessile, quadrate; claws cleft (Siam).
(992) *Chromomicrodus* Ashmead, new genus.
(Type, *Chromomicrodus abbotti* Ashmead, manuscript.)

Eyes very large, extending close to the base of the mandibles, the malar space obsolete; areolet triangular or subtrapezoidal, not petiolate.
(993) *Zelomorpha* Ashmead, new genus.
(Type, *Zelomorpha arizonensis* Ashmead.)

8. Hind wings *without* a closed discoidal cell, inner spur of hind tibiæ never half as long as the basal joint of tarsi; maxillary palpi normal.
Areolet incomplete or wanting.................................. 10
Areolet complete.................................. 9

9. Areolet tetragonal or trapezoidal; subdiscoidal nervure in hind wings originating *at* or *below* the middle of the discoidal nervure, rarely very slightly above; metathorax areolated; abdomen with oblique or transverse impressed furrows................(994) *Brachyrhopalum* Kriechbaumer.
Areolet triangular and usually petiolate; subdiscoidal nervure in hind wings originating *far* above the middle of the discoidal nervure; metathorax not areolated..................................(995) *Microdus* Latreille.

10. Subdiscoidal nervure in hind wings entirely absent, the transverse median nervure straight; metathorax short, exareolated (Australia).
(996) *Orgiloneura* Ashmead, new genus.
(Type, *Orgiloneura antipoda* Ashmead, manuscript.)

11. Areolet wider than long, trapezoidal; first abscissa of the radius thrice as long as the second; marginal cell very wide.............................. 14
Areolet quadrate or nearly; first abscissa of the radius not nearly thrice as long as the second, most frequently shorter; marginal cell narrow....... 12

12. Maxillary palpi 6-jointed; first abscissa of the radius usually shorter than the second; hind wings normally celled 13
Maxillary palpi 4-jointed; first abscissa of the radius longer than the second; hind wings with a discoidal cell and two marginal cells.
(997) *Snellenius* Westwood.

13. Mesonotum *without* furrows or the furrows are indistinctly defined; metanotum *not* areolated, at the most with two median longitudinal carinæ; claws simple..................................(998) *Earinus* Wesmael.
Mesonotum *with* deep furrows which are crenulate anteriorly; metanotum areolated; claws cleft................(999) *Pseudagathis* Kriechbaumer.

14. Maxillary palpi 5-jointed; abdomen narrow, subcompressed and acute at apex, the first segment long, petioliform, coarsely rugulose, the sides parallel.
(1000) *Meteoridea* Ashmead, new genus.
(Type, *Meteoridea longiventris* Ashmead, manuscript.)

Subfamily XI. CARDIOCHILINÆ.

1887. *Toxoneurinæ*, subfamily, CRESSON, Syn. Hym. North America, p. 61.

1900. *Cardiochilinæ*, Subfamily XI, ASHMEAD, Smith's Insects of New Jersey, p. 592.

Cardiochiles Nees (with three or four synonyms) was included by Förster and other European authorities in the subfamily *Microgasterinæ*. In 1887, the Rev. T. A. Marshall, who furnished generic tables of the *Braconidæ* for Mr. Cresson's synopsis of the Hymenoptera of North America, separated Say's genus *Toxoneuron* from other Braconids as a distinct subfamily under the name of *Toxoneurinæ*, the distinguished divine evidently being unaware at that time of the identity of that genus with *Cardiochiles* Nees.

The group is a good one, intermediate between the *Agathidinæ* and the *Microgasterinæ*, and readily distinguished by the venational characters employed in my table of subfamilies.

The following are the essential characters for its recognition:

Front wings with *three* cubital cells, the marginal cell elongate, the third abscissa of the radius reclivate, the second cubital cell longer than wide; hind wings with two marginal cells; mesonotum with distinct furrows converging and meeting posteriorly; metathorax areolated, the areola lozengoidal, rarely indistinct; antennæ 16-jointed.......................................(1001) *Cardiochiles* Nees.

Subfamily XII. MICROGASTERINÆ.

1862. *Microgasteroidæ*, Family 10, Verh. d. naturh. Ver. pr. Rheinl., XIX, pp. 228 and 244.
1885. *Microgasterides* MARSHALL, Trans. Ent. Soc. Lond., p. 10.
1887. *Microgasterinæ*, Subfamily, CRESSON, Syn. Hym. N. A., pp. 54–59.
1888. *Microgasteridæ* MARSHALL, Species des Hym. des Braconides, I, p. 66.
1900. *Microgasterinæ*, Subfamily XII, ASHMEAD, Smith's Insects of New Jersey, p. 592.

This is a large and most difficult group, its nearest allies being the *Agathidinæ* and the *Cardiochilinæ*.

The absence of parapsidal furrows and the rather full characters employed in my table of subfamilies will, however, render the group easily recognized.

The group is probably susceptible of tribal divisions. *Neoneurus* and *Elasmosoma* will fall together; then *Mirax* and allies; and finally the genuine Microgasterines, *Apanteles*, *Microgaster*, etc.

Plumarius Philippi, described from South America, is unknown to me in nature, but evidently, judging from the figure and description, belongs to this group. *Cotesia* Cameron, is also unknown to me; it may yet prove to be identical with *Apanteles* Förster.

The genera at present recognized may be distinguished by the characters made use of in the following table:

TABLE OF GENERA.

Marginal cell completely closed.. 2
Marginal cell incomplete or wholly wanting.................................. 3

2. Areolet oblique, rhomboidal; antennæ 17-jointed, the joints of the flagellum with fascicles of long hairs................(1002) *Plumarius* Philippi.

Areolet subquadrate; antennæ 16-jointed, normal.
(1003) *Neoneurus* Haliday=*Ecclites* Förster.

3. Marginal cell for the most part entirely absent or at most with only the first abscissa of the radius present........ 6

Marginal cell not entirely wanting, the radius present but not extending to the costa, but forming a well-defined, although open, cell........ 4

4. Radius *not* geniculate; metanotum *not* strongly areolated........ 5

Radius geniculate; metanotum sometimes areolated.

Areolet incomplete, but in position, subquadrate; hind portion of the cubitus interstitial with the fore part; antennæ in female 13–14 jointed, in male 14–16 jointed; metanotum not areolated.
(1004) *Elasmosoma* Ruthe.

Areolet wanting or open behind, not subquadrate in position; hind portion of the cubitus emerging from the first discoidal cell; antennæ 21-jointed; metanotum strongly areolated........(1005) *Dirrhope* Förster.

5. Hind portion of the cubitus emerging from the first discoidal cell; antennæ 20-jointed........(1006) *Acœlius* Haliday.

6. Front wings with *three* cubital cells, the second (or areolet) and the third *never* confluent........ 14

Front wings *without* cubital cells, or at most with *two* only, in the latter case the second and third being *confluent*........ 7

7. Front wings with *two* cubital cells, the areolet confluent with the third; the discoidal cells usually distinct and separated; mesonotum normal........ 8

Front wings *without* cubital cells, and the first and second discoidal cells are obliterated or confluent; mesonotum with a large fovea in front of the scutellum; antennæ 21-jointed; hind coxæ very long, subcylindrical.
(1007) *Cœlothorax* Ashmead.

8. Antennæ, in both sexes, 14-jointed; hind wings without a radius.
(1008) *Mirax* Haliday.

Antennæ 17-jointed........(1009) *Cotesia* Cameron.

Antennæ 18-jointed.

Clypeus entirely separated from the face by a grooved line or furrow between the clypeal foveæ........ 12

Clypeus *not* separated from the face by a grooved line or furrow between the clypeal foveæ........ 9

9. Metathorax quite differently formed, *without* a transverse apical carina........ 10

Metathorax short, truncate posteriorly, the truncature bounded superiorly by a transverse carina, the face *with* a distinct petiolar area.
(1010) *Parapanteles* Ashmead, new genus.
(Type, *Apanteles aletiæ* Riley.)

10. Metathorax *with* a distinct median longitudinal carina (rarely nearly obliterated by the coarseness of the sculpture), areolated, or at least with a distinct areola or median area........ 11

Metathorax *without* a trace of a median carina or an areola, smooth, alutaceous, or shagreened, and rarely with a slight median depression.

Second abdominal segment *without* lateral grooved lines.
(1011) *Protapanteles* Ashmead.

Second abdominal segment *with* distinct lateral grooved lines, which converge anteriorly.

11. Metanotum with a distinct median longitudinal carina (rarely nearly obliterated by the coarseness of the sculpture).

Second abdominal segment *not* separated from the third by a deep transverse furrow; ovipositor never prominent, at the most subexserted, the hypopygium plow-share shaped........(1012) *Apanteles* Förster.

Second abdominal segment separated from the third by a deep transverse furrow; ovipositor always long or prominently exserted.
(1013) *Pseudapanteles* Ashmead.

Metanotum areolated or at least with a distinct areola or median area; ovipositor always long or prominently exserted....(1014) *Urogaster* Ashmead.

12. Metathorax *with* a distinct median longitudinal carina (rarely nearly obliterated by the coarseness of the sculpture), areolated, or at least with a distinct areola or median area... 13

Metathorax *without* a trace of, a median carina or an areola, smooth alutaceous or shagreened. (see p. 131).............(1111) *Protapanteles* Ashmead.

13. Metathorax with a median carina longitudinal carina (rarely nearly obliterated by the coarseness of the sculpture).

Ovipositor hidden, *never* prominently exserted....(1012) *Apanteles* Förster.

Ovipositor long or *always* prominently exserted.
(1013) *Pseudapanteles* Ashmead.

Metathorax areolated, or at least with a distinct areola or median area; ovipositor always long or prominently exserted...(1014) *Urogaster* Ashmead.

14. Clypeus entirely separated from the face 18

Clypeus *not* entirely separated from the face................................ 15

15. Metathorax with a prominent median longitudinal carina or the surface very coarsely rugose 16

Metathorax *without* such a carina, but with a more or less distinct median area or areola.

Front wings with the areolet very small; second abdominal segment much shorter than the third ...(1015) *Hypomicrogaster* Ashmead, new genus.
(Type, *Microgaster zonarius* Say.)

16. Second abdominal segment separated from the third by a deep, transverse furrow, *not* trilobed... 17

Second abdominal segment *not* separated from the third by a deep, transverse furrow, and trilobed by two nearly parallel longitudinal grooved lines or furrows; ovipositor at most subexserted, not prominent.
(1016) *Diolcogaster* Ashmead, new genus.
(Type, *Microgaster melligaster* Provancher.)

17. Mesopleural furrow long and crenulate; abdomen elongate, the sides parallel; plate of first segment oblong, quadrate, as wide as the second segment; ovipositor long; last joint of tarsi long and stout; the pulvillus large, longer than the claws ....(1017) *Hygroplitis* Thomson.

Mesopleural furrow wanting or shallowly impressed and smooth; abdomen not especially long, the sides arcuate, never parallel; plate of first segment trapezoidal; ovipositor exserted; last joint of tarsi and the pulvillus normal ....(1018) *Microgaster* Latreille.

18. Hind tibial spurs very long, the inner spur fully two-thirds the length of the basal joint of the tarsi; plate of first abdominal segment very narrow, linear.................................(1019) *Protomicroplitis* Ashmead.
(Type, *Protomicroplitis Germani* Ashmead, manuscript.)

Hind tibial spurs short, the inner spur scarcely one-third the length of the basal joint of the tarsi; plate of first segment variable.
(1020) *Microplitis* Förster.

Subfamily XIII. ICHNEUTINÆ.

1862. *Ichneutoidæ*, Family 20, Förster, Verh. d. naturh. Ver. pr. Rheinl., XIX, pp. 229 and 256.
1885. *Ichneutides* Marshall, Trans. Ent. Soc. Lond., p. 10.
1887. *Ichneutinæ*, Subfamily, Cresson, Syn. Hym. North America, p. 61.
1888. *Ichneutidæ*, Tribe XVII, Marshall, Species des Hym. des Braconides, I, p. 66.
1900. *Ichneutinæ*, Subfamily XIII, Ashmead, Smith's Insects of New Jersey, p. 594.

With this group begins a series of subfamilies quite distinct from the preceding and closest allied to those which are to follow, or Wesmael's *Clyclostomi*.

The *Ichneutinæ* and the *Opiinæ* closely resemble each other and agree fairly well in the venation of the hind wings; the former is, however, easily separated from the latter by the venation of the front wings, the marginal cell being very short, while the anal cell is divided by a transverse nervure or a stump of a nervure.

The species belonging to this group whose parasitism is known all attack the larvæ of various saw-flies (*Tenthredinoidea*).

Only three genera fall into this group, all found in our fauna.

TABLE OF GENERA.

Hind wings with the radius absent 2
Hind wings with the radius present 3

First abscissa of the radius much shorter than the second, the latter being much *longer* than the first transverse cubitus; first joint of the flagellum longer than the scape; maxillary palpi 5-jointed, the end penultimate joints subequal; ocelli normal .... (1021) *Ichneutes* Nees.

2. First abscissa of the radius as long as the second, the second *shorter* than the first transverse cubitus; first joint of the flagellum *not* longer than the scape; maxillary palpi 4-jointed, the last joint much longer than the preceding; ocelli normal .... (1022) *Ichneutidea* Ashmead, new genus.
(Type, *Ichneutes abdominalis* Cresson.)

First abscissa of the radius either much shorter or longer than the second, the second usually a little shorter than the first transverse cubitus; maxillary palpi 5-jointed; ocelli abnormal, the frons being short and the front ocellus placed far anteriorly between the antennæ ...... (1023) *Proterops* Wesmael.

Subfamily XIV. OPIINÆ.

1862. *Opioidæ*, Family 24, Förster, Verh. d. naturh. Ver. pr. Rheinl., XIX, pp. 229 and 258.
1885. *Opiides* Marshall, Trans. Ent. Soc. Lond., p. 11.
1887. *Opiinæ*, Subfamily, Cresson, Syn. Hym. North America, pp. 54 and 61.
1888. *Opiidæ*, Tribe XXII, Marshall, Species des Hym. des Braconides, I, p. 67.
1900. *Opiinæ*, Subfamily XIV, Ashmead, Smith's Insects of New Jersey, p. 594.

This tribe is composed of a great number of minute species, parasitic on Dipterous larvæ, and particularly on leaf-mining species. It is separated from the *Ichneutinæ* by the marginal cell being long, never short, usually extending to or very near the tip of the wing, and by the undivided anal cell.

A few of the species have a more or less distinct mouth opening and may be easily confused with small species in the subfamily *Braconinæ*, the venation of the hind wings alone separating them.

TABLE OF GENERA.

Second cubital cell short, as broad, or nearly, as long........................ 2
Second cubital cell *not* short, much longer than broad........................ 4
2. Second abdominal segment *without* curved transverse furrows.............. 3
Second abdominal segment *with* two curved transverse furrows. (1024) *Gnamptodon* Haliday.
3. Abdomen with more than 3 visible segments. (1025) *Mesotages* Förster ? = *Hedylus* Marshall.
Abdomen with 3 visible segments above; head transverse quadrate, the temples broad; second abscissa of the radius a little shorter than the first transverse cubitus....................(1026) *Sulydus* Du Buysson.
4. Second abscissa of the radius *much* longer than the first transverse cubitus; stigma most frequently narrow or lanceolate 11
Second abscissa of the radius shorter, *not* or scarcely longer than the first transverse cubitus; stigma most frequently broad, ovate or triangular.
Marginal cell completely closed 5
Marginal cell open at apex ....(1027) *Lytacra* Förster.
5. Clypeus *not* horned.. 6
Clypeus horned.................................(1028) *Rhinoplus* Förster.
6. Mouth *not* completely closed, a more or less distinct opening between the clypeus and the mandibles.. 10
Mouth completely closed, the mandibles fitting close to the clypeus........ 7
7. Recurrent nervure received by the second cubital cell...................... 8
Recurrent nervure received by the first cubital cell or interstitial with the first transverse cubitus..........................(1029) *Zeletes* Förster.
8. Clypeus *not* separated from the face by a sharp elevated line, but by a more or less deeply impressed line, *not* thickly hairy.................. 9
Clypeus separated from the face by a sharp elevated line, and thickly hairy. (1030) *Chilotrichia* Förster.
9. Radius originating somewhat *before* the middle of the stigma, rarely from the middle.
Stigma narrow, elongate; first abscissa of the radius rarely half as long as the second, the marginal cell extending to the apex of the wing. (1031) *Biosteres* Förster.
Stigma large, triangular ....(1032) *Trigonospilus* Ashmead, new genus.
(Type, *Trigonospilus Hopkinsi* Ashmead, manuscript.)
Radius originating far *beyond* the middle of the stigma. (1033) *Stenospilus* Förster.
10. Radius originating near, or somewhat beyond, the middle of the stigma, the latter large, thick, ovate or subtriangular..(1034) *Diachasma* Förster.
Radius originating at about the basal third of the stigma. (1035) *Rhabdospilus* Förster.
11. Radius *not* originating from the base of the stigma 12
Radius originating from the base of the linear stigma..(1036) *Eurytenes* Förster.

12. Recurrent nervure interstitial or received by the second cubital cell........ 14
Recurrent nervure received by the first cubital cell.
Mesonotal furrows much abbreviated or entirely absent................ 13
Mesonotal furrows complete. Second discoidal cell open.
(1037) *Holconotus* Förster.

13. Stigma broad; transverse median nervure in hind wings, *with* a trace of a recurrent nervure............................(1038) *Apodesmia* Förster.
Stigma narrow; transverse median nervure in hind wings *without* a trace of a recurrent nervure ....(1039) *Allotypus* Förster.

14. Second abdominal segment *without* a transverse impressed line............ 15
Second abdominal segment *with* a transverse impressed line, the second and third segments subequal.
Stigma lanceolate; second cubital cell sessile...(1040) *Phædrotoma* Förster.

15. Face *without* long hairs, at the most sparsely pubescent..................... 16
Face densely clothed with long hairs; stigma lanceolate; second cubital cell subpetiolate ....(1041) *Eutrichopsis* Förster.

16. Radius *not* originating beyond the middle of the stigma 17
Radius originating beyond the middle of the stigma..(1042) *Therobolus* Förster.

17. Mandibles *not* emarginate on the underside.................................. 19
Mandibles emarginate on the underside.
Mouth completely closed... 18
Mouth more or less open.
First joint of the flagellum longer than the second; second cubital cell subsessile, the marginal cell extending to the tip of the wing.
(1043) *Hypocynodus* Förster.

18. Marginal cell long, closed at or near the tip of the wing; stigma lanceolate, the radius originating *before* the middle, the second abscissa of the radius about twice as long as the first transverse cubitus.
(1044) *Hypolabis* Förster.
Marginal cell short, closed much before the tip of the wing.
(1045) *Cryptonastes* Förster.

19. Second abscissa of the radius much *shorter* than the third.................. 20
Second abscissa of the radius as long as the third.
Stigma narrowed or linear, the radius originating from its basal third or *before* the middle, the first abscissa short but distinct; second discoidal cell closed......................... (1046) *Biophthora* Förster.

20. Mouth more or less open; submedian cell most frequently longer than the median, rarely equal.. 21
Mouth closed; submedian and median cells equal or nearly; stigma lanceolate; second discoidal cell closed.............(1047) *Desmiostoma* Förster.

21. Second discoidal cell open... 22
Second discoidal cell closed.
Stigma large, subtriangular; cubitus originating from or a little beyond the middle of the basal nervure; first abscissa of the radius distinct, *not* short, the second cubital cell therefore distinctly petiolate.
(1048) *Utetes* Förster.
Stigma lanceolate, rarely subtriangular; cubitus originating near the apex of the basal nervure, or near the parastigma, the first abscissa not or scarcely developed, the second cubital cell therefore sessile or subsessile ....(1049) *Opius* Wesmael.

22. Stigma narrowed, linear.............................(1050) *Nosopœa* Förster.

Subfamily XV. BRACONINÆ.

1862. *Braconidæ*, Family I, FÖRSTER, Verh. d. naturh. Ver. pr. Rheinl., XIX, pp. 227 and 234.
1885. *Braconides* MARSHALL, Trans. Ent. Soc. Lond., p. 1.
1887. *Braconinæ*, Subfamily, CRESSON, Syn. Hym. North Amer., pp. 54 and 56.
1888. *Braconidæ*, Tribe I, MARSHALL, Species des Hym. des Braconides, I, p. 65.
1900. *Braconinæ*, Subfamily XV, ASHMEAD, Smith's Insects of New Jersey, p. 595.

This subfamily and the following, the *Rhogadinæ* and the *Spathiinæ*, represent Wesmael's division *Cyclostomi*, distinguished from the preceding groups by having the clypeus emarginate or impressed anteriorly, and forming, with the mandibles, a semicircular opening.

The species belonging to this subfamily are easily recognized by the *very short* submedian cell in the hind wings and the non-margined occiput, temples, and cheeks. In the *Spathiinæ* and the *Rhogadinæ* the submedian cell in the hind wings is *never* very short and the occiput, the temples, and the cheeks are most frequently distinctly margined.

Three tribes or minor groups, have been recognized, distinguished principally by the length of the submedian cell in the front wings.

TABLE OF TRIBES.

Submedian cell much *shorter* than the median; eyes large, extending clear to the base of the mandibles, the malar space wanting...Tribe I. APHRASTOBRACONINI.
Submedian and median cells *equal;* eyes not extending to the base of mandibles. Tribe II. BRACONINI.
Submedian cell distinctly *longer* than the median; eyes not extending to base of the mandibles....................................Tribe III. EUUROBRACONINI.

Tribe I. APHRASTOBRACONINI.

This tribe is based upon a species described recently by the writer from Ceylon; it differs from all other Braconids belonging to the subfamily *Braconinæ* by the submedian cell being much shorter than the median, by the large eyes, and the absence of a malar space:

Head transverse, the eyes very large, occupying the whole side of the head, the face and vertex being very narrow; marginal cell extending to tip of the wing, the median cell much longer than the submedian..(1051) *Aphrastobracon* Ashmead.
(Type, *Aphrastobracon flavipennis* Ashmead.)

Tribe II. BRACONINI.

To this tribe belong the vast majority of the species found in the subfamily *Braconinæ;* they are separated at a glance from all others by having the median and submedian cells of an equal length, the transverse median nervure being distinctly *interstitial* with the basal nervure.

Twenty-one genera have been recognized, separable as follows:

TABLE OF GENERA.

Abdomen with the sutures between the segments deep and usually crenulate, the apical margins of the segments sometimes rimmed or reflexed....... 2

Abdomen with the sutures between the segments normal, or at the most with only the second deep and crenulate, the second and third sometimes connate; dorsal segments without transverse furrows, except sometimes the second... 5

2. Head transverse, the temples more or less narrowed or oblique............ 4

Head quadrate or nearly, the temples broad.

Scape simple, unarmed.. 3

Scape armed with a tooth beneath.

(1052) *Odontoscapus* Gribodo ?=*Chaoilta* Cameron.

3. Abdomen elongate and much narrowed; dorsal segments 3–5 at base, with broad, transverse, crenate furrows and with oblique, usually crenate, furrows laterally, the apical margins elevated. (Siam.)

(1053) *Zaglyptogastra* Ashmead, new genus.

(Type, *Zaglyptogaster abbotti* Ashmead, manuscript.)

Abdomen broad, oblong-oval; dorsal segments 2–4, with deep, transverse, usually crenate, furrows, the second also with an oblique furrow on each side, extending from the basal middle to the lateral depressions.

(1054) *Iphiaulax* Förster=*Ipobracon* Thomson.

4. Abdominal segments 2–4, with oblique lateral impressions, and all longitudinally striate or aciculate....................(1055) *Glyptomorpha* Holmgren.

5. Labrum short, *not* elongate or rostriform................................ 6

Labrum elongate, rostriform or nearly.

Abdomen elongate, the second dorsal segment and sometimes the third with oblique or curved lateral furrows or depressions, basal segments for the most part longitudinally striate or aciculate.....(1056) *Vipio* Latreille.

6. Head transverse or obtrapezoidal, as seen from above, the temples rarely broad, usually narrow or very oblique, never as broad as the width of the eyes; metathoracic spiracles most frequent, very minute, inconspicuous.... 11

Head quadrate or cubical, the temples broad.

Hind wings with only *one* marginal cell................................ 7

Hind wings with *two* marginal cells............(1057) *Heteropteron* Brullé.

7. Anterior tarsi not twice as long as their tibiæ; penultimate abdominal segment *not* so long as the preceding.. 8

Anterior tarsi at least twice as long as their tibiæ; penultimate abdominal segment twice as long as the preceding ....(1058) *Megaproctus* Brullé.

8. Second cubital cell shorter than the first; the second abscissa of the radius rarely longer than the first transverse cubitus, and most frequently shorter than the first abscissa of the cubitus; scape not long, subglobose, obconic or clavate; pedicel and first joint of the flagellum equal or nearly.. 10

Second cubital cell always much longer than the first; the second abscissa of the radius nearly twice as long as (or even longer than) the first transverse cubitus.

Eyes not so large, entire, never emarginate within...................... 9

Eyes very large, occupying the whole sides of the head and emarginate within opposite the insertion of the antennæ (Africa).

(1059) *Curriea* Ashmead, new genus.

(Type, *Curriea fasciatipennis* Ashmead, manuscript.)

9. Scape rather long, cylindrical, truncate at apex, the pedicel much shorter than the first joint of the flagellum, the third flagellar joint shorter than

either the first or second; second dorsal abdominal segment with oblique lateral depressions which extend from the basal middle.
(1060) *Melanobracon* Ashmead, new genus.
(Type, *Bracon simplex* Cresson.)

Scape subglobose, obliquely truncate at apex, the pedicel annular, scarcely one-third the length of the first joint of the flagellum, the second and third flagellar joints equal, hardly so long as wide, shorter than the first; abdomen smooth, polished, banded with white, the second dorsal segment with smooth oblique lateral impressions, the third sometimes with a transverse furrow at base (Australia).
(1061) *Callibracon* Ashmead, new genus.
(Type, *Bracon limbatus* Brullé.)

10. Third joint of the flagellum longer than either the first or the second, the first shorter than the second; abdomen elongate, the second dorsal segment with lateral grooved lines, oblique at base.... (1062) *Cœloides* Wesmael.

Third joint of the flagellum *not* longer than the second, both about equal.
(1063) *Atanycolus* Förster.

11. Metathorax smooth, *without* a median carina........................ 12

Metathorax *with* a distinct median carina.................................. 20

12. Second abscissa of the radius much longer than, and sometimes twice as long as, the first (or even longer), always much longer than the first transverse cubitus.. 13

Second abscissa of the radius *not*, or scarcely, longer than the first, usually a little shorter than the first transverse cubitus, or no longer.......... 19

13. Radius *not* extending to the tip of the wing.............................. 17

Radius extending to the tip of the wing.

Legs densely hairy.. 15

Legs *not* densely hairy.. 14

14. Abdomen abnormal, short rounded, above highly convex, beneath concave, with only four or five visible dorsal segments........................ 16

Abdomen normal, never very short, often elongate, with the usual number of segments.

Scape three or more times longer than thick, subcylindrical, with the apical margin beneath acutely produced; first joint of the flagellum nearly twice as long as the second; abdomen elongate, much longer than the head and thorax united, narrowed toward the base, smooth, but the first and second dorsal segments with deep lateral grooved lines, furrows, or depressions, the third with two shallow oblique impressions; metathoracic spiracles large, linear, placed behind the middle; all tarsi longer than their tibiæ, and the joints armed with stiff bristles or spines at apex.....................(1064) *Compsobracon* Ashmead, new genus.
(Type, *Exothecus magnificus* Ashmead, manuscript.)

Scape subglobose, or not twice as long as thick, shorter than the first joint of the flagellum, or no longer, and rarely more than two and one-half times as long as thick; first joint of the flagellum slightly the longest joint, or never shorter than the second or the third; pedicel about twice as long as thick; abdomen oblong oval, not longer than the head and thorax united, smooth, except sometimes the first and second at base laterally, which are usually striate, the second dorsal segment *without* lateral grooved furrows, the third simple *without* impressions; metathoracic spiracles small, rounded, placed at or a little before the middle; tarsi unarmed, the last joint about the length of the second.
(1065) *Macrodyctium* Ashmead, new genus.
(Type, *Bracon euuræ* Ashmead.)

15. Scape short, subglobose; first joint of the flagellum twice as long as the pedicel; abdomen oblong, segments 3–5, with transverse grooved lines or furrows; metathoracic spiracles minute, inconspicuous, placed before the middle .... (1066) *Myosoma* Brullé.

16. Mesonotal furrows complete and only slightly converging posteriorly; scutellum convex, with a crenate furrow across the base; first and second abdominal segments coarsely rugose, occupying most of the surface; the second and the third very large, closely united; the fourth and fifth very short, opaque, shagreened; the sixth often retracted, but emarginate medially at apex for the reception of the ovipositor; scape subglobose, truncate at apex; pedicel annular, wider than long; first three joints of the flagellum about of an equal length, scarcely longer than thick. (Japan.)
(1067) *Chelonogastra* Ashmead, new genus.
(Type, *Chelonogastra Koebelei* Ashmead, manuscript.)

17. Abdomen normal, *not* spinous 18
Abdomen abnormal, spinous.
Scape long, angulated beneath .... (1068) *Binarea* Brullé.

18. Frons flat, not or scarcely impressed above the insertion of the antennæ; mesopleura without a furrow.
Abdomen smooth, as in *Macrodyctium*, or at the most with segments 1–3 finely sculptured, the ovipositor usually long, more rarely shorter than the abdomen; scape subglobose, very little longer than thick, the first slightly the longest; first dorsal segment with two furrows which converge anteriorly; last joint of hind tarsi distinctly shorter than the second .... (1069) *Microbracon* Ashmead.
Abdomen with all the segments, except sometimes the apical segments, sculptured, shagreened, or coriaceous, the fourth segment very rarely smooth; first joint of the flagellum distinctly longer than the second, the third a little shorter than the second; first dorsal segment of abdomen rarely much longer than wide at apex, with a depression and a sulcus at base; last joint of hind tarsi long, as long, or nearly, as the second.
(1070) *Bracon* Fabricius.

19. First discoidal cell petiolate; head, thorax, and abdomen most frequently coriaceous or shagreened, rarely smooth and shining; antennal characters as in *Bracon* (*Sensu stricti*); ovipositor short, rarely two-thirds the length of the abdomen, most frequently much shorter; last joint of hind tarsi about the length of the third, shorter than the second.
(1071) *Habrobracon* Ashmead.

20. Mesothoracic furrows more or less distinctly impressed, the middle lobe prominently elevated *anteriorly;* scutelum with a crenate furrow across the base.
Abdomen with the sutures between the segments distinct, well defined; tarsi normal, the last joint of the hind tarsi not enlarged, shorter than the second joint; first joint of the flagellum about twice as long as thick, *not* or scarcely longer than the second; ovipositor either long or short, normal, the sheaths *not* broad.
(1072) *Tropidobracon* Ashmead, new genus.
(Type, *Bracon gastroidea* Ashmead.)
Abdomen with the sutures after the first poorly defined, indistinct; tarsi abnormal, the last joint much enlarged, as long as the first; first joint of the flagellum about thrice as long as thick, a little longer than the second; ovipositor very stout, shorter than the abdomen, but with the sheaths broad .... (1073) *Baryproctus* Ashmead, new genus.
(Type, *Bracon barypus* Marshall.)

Tribe III. EUUROBRACONINI.

This tribe is based upon a Japanese species named by Frederick Smith *Bracon penetrator;* it is remarkable for the length of the ovipositor, which is many times longer than the whole insect and recalls that found in certain Pimplids—*Rhyssa* and *Thalessa*.

Submedian cell distinctly longer than the median.
(1074) ***Euurobracon*** **Ashmead, new genus.**
(Type, *Bracon penetrator* Smith.)

Subfamily XVI. RHOGADINÆ.

1900. *Rhogadinæ*, Subfamily XVI, Ashmead, Smith's Insects of New Jersey, p. 596.

The distinctly margined occiput, temples, and cheeks, and the longer submedian cell in the hind wings, readily separate this subfamily from the *Braconinæ*, while from the *Spathiinæ* it is distinguished by mesonotal characters, and by the subdiscoidal nervure in the front wings, which originates *below* the middle of the discoidal nervure, never from above the middle. A single minor group has the occiput immargined, the cheeks are, however, margined.

The group is dividable into five tribes, or minor groups, called subfamilies by some writers, distinguishable by the characters employed in the following table:

TABLE OF TRIBES.

Front wings with *two* cubital cells 5
Front wings with *three* cubital cells 2
2. Head transverse, narrowed, never full behind the eyes, the temples *not* broad 3
Head large, quadrate or cubical, full behind the eyes, the temples broad.... 4
3. Abdominal segments 1 and 2 *without* a median longitudinal carina, the thyridia usually wanting, rarely dictinct; ovipositor strongly exserted, or prominent.
Head with the occiput immargined; radius in hind wings entirely obsolete or subobsolete ....Tribe I. Exothecini.
Head with the occiput always margined; radius in hind wings usually distinct ....Tribe II. Rhyssalini.
Abdominal segments 1 and 2 and sometimes 3 *with* a longitudinal median carina, the thyridia distinct; ovipositor never prominent, at most subexserted.
Tribe III. Rhogadini.
4. Abdominal segments 1 and 2 *without* a median carina, at most rugulose or striate; ovipositor long ....Tribe IV. Doryctini.
5. Head quadrate, full behind the eyes, the temples broad..Tribe V. Hecabolini.

Tribe I. EXOTHECINI.

1862. *Exothecoidæ*, Family, FÖRSTER, Verh. d. naturh. Ver. pr. Rheinl., XIX, p. 279.
1885. *Exothecides* MARSHALL, Trans. Ent. Soc. Lond., p. 9.
1887. *Exothecinæ*, Subfamily, CRESSON, Syn. Hym. North America, p. 56.
1888. *Exothecidæ*, Tribe II, MARSHALL, Species des Hym. des Braconides, I, p. 65.
1900. *Exothecini*, Tribe V, ASHMEAD, Smith's Insects of New Jersey, p. 597.

This tribe is readily separated from the others by the immargined occiput. It comes nearest in this respect to the subfamily *Braconinæ*, with which the species are easily confused. The venation of the hind wings is, however, quite distinct from the species in that group, the submedian cell being always much longer, nearly half the length of the median cell, while in the *Braconinæ* it is never more than one-third the length of the median cell.

Eight genera belong to this tribe, separable as follows:

TABLE OF GENERA.

Suturiform articulation distinct, crenulate.......... 2
Suturiform articulation obsolete.......... 3
2. Stigma large, oval, the marginal cell closed a little before the tip of the wing.
(1075) *Zamegaspilus* Ashmead, new genus.
(Type, *Zamegaspilus Hopkinsi* Ashmead, manuscript.)
Stigma normal, the marginal cell closed at the apex of the wing; metathorax with a delicate median carina; second dorsal abdominal segment with a cross furrow.......... (1076) *Phanomeris* Förster.
3. Radius originating from the middle of the stigma.......... 4
Radius originating far *beyond* the middle of the stigma.......... 5
Radius originating much *before* the middle of the stigma.
Submedian cell much longer than the median, the transverse median nervure joining the median vein far *beyond* the origin of the basal nervure.
(1077) *Exothecus* Wesmael.
Submedian cell *not* longer than the median, the transverse median nervure interstitial with the basal nervure.......... (1078) *Xynobius* Förster.
4. Recurrent nervure received by the first cubital cell. Second abscissa of the radius more than twice as long as the first; abdominal segments 2–3, smooth, shining, the first sometimes aciculate.
Second discoidal cell closed.......... (1079) *Rhysipolis* Förster.
Second discoidal cell open.......... (1080) *Lytopylus* Förster.
Recurrent nervure received by the second cubital cell.
(1081) *Bathystomus* Förster.
5. Recurrent nervure received by the first cubital cell; second abdominal segment *without* a transverse furrow.......... (1082) *Xenarcha* Förster.

Tribe II. RHYSSALINI.

1862. *Rhyssaloidæ*, Family 7, FÖRSTER, Verh. d. naturh. Ver. pr. Rheinl., XIX, pp. 228 and 241.
1885. *Rhyssalides* MARSHALL, Trans. Ent. Soc. Lond., p. 9.
1887. *Rhyssalinæ*, Subfamily, CRESSON, Syn. Hym. North America, p. 56.
1900. *Rhyssalini*, Tribe IV, ASHMEAD, Smith's Insects of New Jersey, p. 596.

This tribe is composed of a number of minute species easily confused with some in the tribe *Exothecini*, and great care must be given to the examination of the head before the species can be placed, the occiput in this group being distinctly margined, while in the former it is immargined. The presence of a radius in the hind wings assist somewhat in placing these insects, but the character is only of secondary importance since it is absent in some forms.

Nine genera fall into this tribe, distinguishable by the use of the following table:

TABLE OF GENERA.

Recurrent nervure *interstitial* with the first transverse cubitus or received by the *first* cubital cell.. 2
Recurrent nervure received by the *second* cubital cell.......................... 9
2. Marginal cell in front wings completely closed........................ 3
Marginal cell in front wings open at apex.
Stigma narrow, lanceolate, the radius originating a little beyond its middle. (1083) *Ademon* Haliday.
3. Radius originating *at* or much *beyond* the middle of the stigma............ 5
Radius originating somewhat *before* the middle of the stigma.
Abdomen always broadened at the middle, oval or oblong-oval.......... 4
Abdomen sessile sublinear, scarcely broadened at the middle, the second segment longer than the two following united, the fourth somewhat shorter than the third ....(1084) *Camptocentrus* Kriechbaumer.
4. Second abdominal segment *with* two oblique furrows, the hind margin tumid; legs short, the femora much swollen.
(1085) *Glyptocolastes* Ashmead, new genus.
(Type, *Glyptocolastes texanus* Ashmead, manuscript.)
Second abdominal segment *without* oblique furrows, the hind margin *not* tumid; metanotum with a median carina and a small triangular areola; legs not short, slender..................................(1086) *Colastes* Haliday.
5. Radius originating from the middle of the stigma or only a little beyond.... 6
Radius originating from the last third of the stigma........................ 8
6. Metanotum with a short median carina, which is usually forked at apex.
Abdomen in female *not* compressed at apex, with the hind margins of segments 2 and 3, and sometimes one or more of the following, tumid; stigma strongly angulate at the origin of the radius................. 7
Abdomen in female compressed at apex, with the hind margin of segments 2 and 3 normal, *not* tumid; dorsal segments 1–3 rugulose; stigma not angulate at the origin of the radius....... (1087) *Clinocentrus* Haliday.
7. First abscissa of the radius very short, less than half the length of the first transverse cubitus (or scarely longer); second abdominal segment very little longer than the first; metathorax with an areola and a petiola area.
(1088) *Oncophanes* Förster.
First abscissa of radius much longer, fully half the length of the first transverse cubitus or longer; second abdominal segment very large, nearly twice as long as the first...........(1089) *Epirhyssalus* Ashmead, new genus.
(Type, *Epirhyssalus californicas* Ashmead, manuscript.)
8. Stigma scarcely angulate at the origin of the radius.
(1090) *Noserus* Förster.
9. Metathorax areolated, the basal area always complete; radius originating beyond the middle of the stigma; hind tibiæ in male thick, clavate.
(1091) *Rhyssalus* Haliday.
Metathorax *not* areolated; radius originating from the middle of the stigma; hind tibiæ in male normal................(1092) *Eurybolus* Ratzeburg.

Tribe III. RHOGADINI.

1862. *Rhogadoidæ*, Family 6, Förster, Verh. d. naturh. Ver. pr. Rheinl., XIX, pp. 228 and 240.
1885. *Rhogadides* Marshall, Trans. Ent. Soc. Lond., p. 10.
1887. *Rhogadinæ*, Subfamily, Cresson, Syn. Hym. North America, p. 58.
1888. *Rhogadidæ*, Tribe VIII, Marshall, Species des Hymén. des Braconides, I, p. 66.
1900. *Rhogadini*, Tribe III, Ashmead, Smith's Insects of New Jersey, p. 596.

The species falling in this tribe are very characteristic, and among the easiest of all Braconids to recognize by the longitudinal carinæ on the first and second abdominal segments and their characteristic sculpture.

Five genera fall into this tribe, all occurring in our fauna. They may be readily distinguished by the use of the following table:

TABLE OF GENERA.

Sutariform articulation obsolete 2
Sutariform articulation distinct, crenulate 4
2. Abdomen *not* longer than the head and thorax united, in female not strongly compressed 3
Abdomen longer than the head and thorax united, in female strongly compressed from before the middle toward the apex; ovipositor subexserted; second cubital cell rectangular .... (1093) *Petalodes* Wesmael.
3. Tarsi very short, hardly half the length of the tibiæ; second cubital cell small, shorter than the first abscissa of the radius .... (1094) *Yelicones* Cameron.
4. Third joint of the maxillary palpi normal 5
Third joint of the maxillary palpi dilated inwardly; ovipositor slightly exserted. (1095) *Pelecystoma* Wesmael.
5. First abscissa of the radius longer than the second, the second cubital cell quadrate; terminal abdominal segments more or less retracted. (1096) *Heterogamus* Wesmael.
First abscissa of the radius shorter than the second, the second cubital cell longer than wide, or trapezoidal .... (1097) *Rhogas* Nees.

Tribe IV. DORYCTINI.

1862. *Doryctoidæ*, Family 4, Förster, Verh. d. naturh. Ver. pr. Rheinl., XIX, pp. 227 and 238.
1885. *Doryctides* Marshall, Trans. Ent. Soc. Lond., p., 9.
1887. *Doryctinæ*, Subfamily, Cresson, Syn. Hym. North America, p., 57.
1888. *Doryctidæ*, Tribe VI, Marshall, Species des Hymén. des Braconides, I, p. 65.
1900. *Doryctini*, Tribe II, Ashmead, Smith's Insects of New Jersey, p. 596.

This tribe has been heretofore treated as a subfamily equivalent in value to the *Braconinæ*, with which some of them are frequently confused, although they ought not to be, since the head is distinctly margined and the venation of the hind wings is wholly different, the submedian cell being very long, longer than half the length of the median.

To my eyes the two groups are quite distinct and have little in common, the resemblance to each other being merely superficial.

Ten genera belong to this tribe, among which is the genus *Stenophasmus* Smith, placed by some authorities with the *Stephanidæ*. I have not seen the type of this genus, however, and what American hymenopterologist take for it may be quite a distinct genus. Our species, placed in it, are easily confused with the genus *Spathius* on account of the petiolate abdomen and the similarity of venation.

TABLE OF GENERA.

Second abdominal segment separated from the third by a strong transverse furrow. 2

Second abdominal segment blending with the third, *not* separated by a strong transverse furrow 3

2. Hind coxæ armed with a strong tooth or spine above.
(1098) *Odontobracon* Cameron=*Syngaster* Brullé (part.)

Hind coxæ normal, unarmed.

Recurrent nervure received by the *first* cubital cell.
(1099) *Hedysomus* Förster ?=*Zombrus* Marshall.

Recurrent nervure received by the *second* cubital cell.
(1100) *Rhaconotus* Reinhard.

3. Basal joint of the hind tarsi *not* longer than the four following joints united; antennæ very long.. 4

Basal joint of the hind tarsi about twice as long as the four following joints united; antennæ very short..............(1101) *Histeromerus* Wesmael.

4. Recurrent nervure received by the *first* cubital cell, or *interstitial* with the first transverse cubitus 5

Recurrent nervure received by the second cubital cell.

Second and third abscissæ of the radius and the cubitus abnormally *thickened;* hind wings *without* an anal cell............(1102) *Caenopachys* Förster.

Second and third abscissæ of the radius normal, *not* thickened; hind wings with an anal cell..........(1103) *Doryctomorpha* Ashmead, new genus.
(Type, *Doryctomorpha antipoda* Ashmead, manuscript.)

5. Abdominal segments *without* arcuate punctate lines, at the most with the second segment only with oblique impressed lines......................... 6

All abdominal segments *with* punctate, arcuate lines; recurrent nervure interstitial with the first transverse cubitus.
(1104) *Bathycentor* Kriechbaumer.

6. Second abdominal segment *without* deep oblique impressed lines; hind wings in male *without* a stigma.. 7

Second abdominal segment *with* two distinct oblique impressions or lines; hind wings in male usually *with* a stigma, rarely without; recurrent nervure *not* interstitial ....(1105) *Glyptodoryctes* Ashmead, new genus.
(Type, *Heterospilus caryæ* Ashmead, manuscript.)

7. Submedian cell *not* longer than the median; abdomen distinctly petiolate, the first segment long and slender.. 8

Submedian cell longer than the median; abdomen sessile.

Metathorax more or less distinctly areolated, or at least always with a complete areola or basal and lateral areas; first joint of the flagellum distinctly longer than the second; basal abdominal segment striate or sculptured, the second and following usually smooth, polished, rarely with the second striate at base ....(1106) *Ischiogonus* Wesmael.

Metathorax *not*, or incompletely, areolated, the areola, if at all defined, open behind, the lateral areas never distinct; first joint of the flagellum *not* longer than the second, equal or slightly shorter; first abdominal segment base of the second, as well as sometimes the following segments, striate or sculptured .... (1107) *Dorycles* Haliday.

Submedian cell *not* longer than the median; abdomen distinctly petiolate, the first segment very long and slender; metathorax sculptured but exareolated; antennæ long and slender, the first and second joints of the flagellum about equal in length .... (1108) *Stenophasmus* Smith.

Tribe V. HECABOLINI.

1862. *Hecaboloidæ*, Family 3, FÖRSTER, Verh. d. naturh. Ver. pr. Rheinl., XIX, pp. 227 and 236.
1887. *Hecabolinæ*, Subfamily, CRESSON, Syn. Hym. North America, p. 57.
1888. *Hecabolidæ*, Tribe IV, MARSHALL, Species des Hym. des Braconides, I, p. 65.
1900. *Hecabolini*, Tribe I, ASHMEAD, Smith's Insects of New Jersey, p. 596.

This tribe is easily separated from all the others in this group by the venation of the front wings, which have only *two* cubital cells; otherwise it resembles the *Doryctini*, the species falling in it having a cubical-shaped head.

Only two genera have been recognized, separable as follows:

TABLE OF GENERA.

Marginal cell narrow, cuneiform, prolonged to the tip of the wing; second abdominal segment *with* two converging furrows; hind wings in male *without* a stigma. (1109) *Eucorystes* Marshall.

Marginal cell normal, or cultriform; second abdominal segment *without* converging furrows; hind wings in male with a stigma............ (1110) *Hecabolus* Curtis.

Subfamily XVII. SPATHIINÆ.

1862. *Euspathioidæ*, Family 2, FÖRSTER, Verh. d. naturh. Ver. pr. Rheinl., XIX, pp. 227 and 236.
1887. *Spathiinæ*, Subfamily, CRESSON (part) Syn. Hym. North America, p. 57.
1888. *Spathiidæ*, Tribe III, MARSHALL (part) Species des Hym. des Braconides, I, p. 65.
1900. *Spathiinæ*, Subfamily XVII, ASHMEAD, Smith's Insects of New Jersey, p. 597.

With this subfamily I terminate the genuine Braconids, and consider it the connecting link between the families *Braconidæ* and *Stephanidæ*. Its nearest allies are to be found among the *Rhogadinæ*, but from them it is readily separated by the minute, tibial spurs, and in having the subdiscoidal nervure either interstitial or originating *above* the middle of the discoidal nervure.

The group is dividable into three tribes, usually treated as subfamilies, and recognizable by the characters made use of in the following table:

TABLE OF TRIBES.

Abdomen sessile; head transverse, very rarely quadrate.
  Front wings with *two* cubital cells or less; recurrent nervure in hind wings and the submedian cell wanting; female sometimes apterous, with only three visible segments.......................................Tribe I. PAMBOLINI.
  Front wings with *three* cubical cells, the subdiscoidal vein *interstitial* or nearly; recurrent nervure in hind wings rarely present, the submedial cell distinct; no apterous forms known ....Tribe II. HORMIINI.
Abdomen petiolate; head quadrate, rarely subquadrate; front wings with three cubital cells ....Tribe III. SPATHIINI.

Tribe I. PAMBOLINI.

1862. *Hecaboloidæ*, Family 3 (part), FÖRSTER, Verh. d. naturh. Ver. pr. Rheinl., XIX, pp. 227 and 236.
1885. *Pambolides* (part), MARSHALL, Trans. Ent. Soc. Lond., p. 9.
1887. *Pambolinæ*, Subfamily (part), CRESSON, Syn. Hym. North Amer., p. 57.
1888. *Pambolidæ*, Tribe V (part), MARSHALL, Species des Hym. des Braconides, I, p. 65.
1900. *Pambolini*, Tribe I, ASHMEAD, Smith's Insects of New Jersey, p. 597.

This tribe is distinguished from the *Spathiinæ* by having the abdomen sessile, never petiolate, and from the *Hormiini* by having only two cubital cells in the front wings. It also includes all the wingless species known in the subfamily.

I am in doubt as to the sexes of *Arhaphis* Ruthe and *Pambolus* Haliday. Mr. Marshall has united both under the genus *Pambolus* Haliday, but he has recently described and figured what I take to be a winged form of either *Pambolus* or *Arhaphis* under the genus *Phænodus*. Phænodus is known to me in nature, and has *three* cubital cells, not two as figured by Marshall. *Pambolus* is known to me in the female sex alone.

TABLE OF GENERA.

Metathorax normal, unarmed 2
Metathorax armed with two spines or teeth. Male.
(1111) *Arhaphis* Ruthe ?= *Pambolus* Haliday.
2. Winged 5
  Wingless or at most with minute wing pads.
    Antennæ more than 12-jointed; basal joint of the hind tarsi normal, *not* inflated 3
    Antennæ 12-jointed; basal joint of the hind tarsi very large, inflated or incrassated. Male ....(1112) *Sactopus* Ashmead, new genus.
    (Type, *Sactopus schwarzii* Ashmead, manuscript.)
3. Abdomen with from 4 to 6 segments 4
  Abdomen with 2 segments. Female (see p. 147.) .... (1113) *Pambolus* Haliday.
4. Antennæ 16-jointed, longer than the body; head large, quadrate; abdomen with at least 6 segments, the ovipositor scarcely half the length of the abdomen (Hawaii)............(1114) *Ecphylopsis* Ashmead, new genus.
    (Type, *Ecphylopsis nigra* Ashmead, manuscript.)
  Antennæ 18-jointed, much shorter than the body; head transverse; abdomen with 4 to 5 segments, the first and second occupying most of the surface;

ovipositor very long, nearly the length of the body; maxillary 4—, labial palpi, 3-jointed.......... (1115) *Pambolidea* Ashmead, new genus.
(Type, *Pambolidea yuma* Ashmead, manuscript.)

5. Front wings with only *one* cubital cell.............................. 13
Front wings with *two* cubital cells.
Marginal cell completely closed.................................... 6
Marginal cell open at apex.
Hind tibiæ in male thickened clariform ....(1116) *Acrisis* Förster.

6. First cubital and first discoidal cells *not* confluent, distinctly separated...... 7
First cubital and first discoidal cells *confluent*, the first abscissa of the cubitus wanting 10

7. Recurrent nervure received by the *first* cubital cell.......................... 8
Recurrent nervure *interstitial* or received by the *second* cubital cell; mesonotum trilobed ....(1117) *Monolexis* Förster.

8. Transverse median nervure present; the second discoidal cell is therefore distinct... 11
Transverse median nervure wanting; the second discoidal cell is therefore absent or *confluent* with the submedian cell 9

9. Antennæ 13-jointed; basal joint of the hind tarsi stout or incrassated, and as long as all the other joints united. Female.. (1112) *Sactopus* Ashmead.
Antennæ more than 13-jointed; basal joint of the hind tarsi normal.
Subdiscoidal nervure interstitial ....(1118) *Ecphylus* Förster.
Subdiscoidal nervure *not* interstitial............(1119) *Euchasmus* Marshall.

10. Submedian and the second discoidal cells confluent, the tranverse median nervure wanting; antennæ in female 16-jointed (Hawaii).
(1120) *Paraecphylus* Ashmead, new genus.
(Type, *Paraecphylus websteri* Ashmead, manuscript.)

11. Hind wings in male *with* a stigma.
Cubitus distinct, *not* obliterated just behind the first transverse cubitus..... 12
Cubitus obliterated just behind the first transverse cubitus.
(1121) *Miocolus* Förster.

12. Abdomen elongate, much longer than the head and thorax united, the second and third segments distinctly separated by a transverse suture.
(1122) *Polystenus* Förster = *Rhoptrocentrus* Marshall.
Abdomen oval, *not* longer than the head and thorax united, the second and third segments quite coalescing (see p. 146)..(1113) *Pambolus* Haliday.

13. Cubical cell separated from the first discoidal cell; subdiscoidal vein interstitial.
(1123) *Achoristus* Ratzeburg.
Cubital cell confused or confluent with the first discoidal cell.
(1124) *Telebolus* Marshall.

Tribe II. HORMIINI.

1862. *Rhyssaloidæ*, Family 7, FÖRSTER (part), Verh. d. naturh. Ver. pr. Rheinl., XIX, pp. 227 and 241.
1862. *Hormioidæ*, Family 5, FÖRSTER, Verh. d. naturh. Ver. pr. Rheinl., XIX, pp. 227 and 240.
1885. *Hormiides* MARSHALL, Trans. Ent. Soc. Lond., p. 9.
1887. *Hormiinæ*, Subfamily, CRESSON, Syn. Hym. North America, p. 58.
1888. *Hormiidæ*, Tribe VII, MARSHALL, Species des Hym. des Braconides, I, p. 66.
1900. *Hormiini*, Tribe II, ASHMEAD, Smith's Insects of New Jersey, p. 597.

This tribe, in having the abdomen sessile, agrees with the tribe *Pambolini*, but is readily separated by the venation of the front wings, which have *three* cubital cells, never less, and by having a distinct submedian cell in the hind wings.

Nine genera have been recognized, distinguishable as follows:

TABLE OF GENERA.

Upper hind angles of the metathorax produced into long spines.................. 7

Upper hind angles of the metathorax normal, unarmed 2

2. Median and submedian cells in front wings usually of an equal length, very rarely with the submedian cell much the longer; antennæ from 17 to 36 jointed 3

Median cell much shorter than the submedian; antennæ 12-jointed. (1125) *Chremylus* Haliday.

3. First transverse cubitus distinct, the first and second cubital cells *not* confluent 4

First transverse cubitus more or less obsolete, so that the first and second cubital cells are confluent..................................... 6

4. Subdiscoidal nervure *not* interstitial, strongly curved at the base............ 5

Subdiscoidal nervure interstitial.

Recurrent nervure received by the second cubital cell. (1126) *Hormius* Nees.

Recurrent nervure interstitial with the first transverse cubitus. (1127) *Hormiopterus* Girard.

5. Head subquadrate; second abdominal segment long, with a transverse impressed line; wings fasciate; scutellum *not* flat, elevated or conical. (1128) *Callihormius* Ashmead, new genus.
(Type, *Pambolus bifasciatus* Ashmead, manuscript.)

Head quadrate; second abdominal segment *without* a transverse impressed line; scutellum not elevated.

Submedian cell distinctly longer than the median; second abscissa of the radius *not* longer than the first transverse cubitus, usually shorter; hind wings in male *with* a stigma...............(1129) *Dendrosoter* Wesmael.

Submedian cell *not* or scarcely longer than the median; second abscissa of the radius usually much longer than the first transverse cubitus; hind wings in male *without* a stigma................(1130) *Atoreutus* Förster.

6. Head quadrate; hind wings in male *with* a stigma, rarely without.

Abdomen with 6 or 7 segments .....(1131) *Heterospilus* Haliday=*Synodus* Ratzeburg=*Cænophnues* Förster=*Earybolus* Thomson.

Abdomen with only 3 visible segments; hind wings in male *without* a stigma....................(1132) *Trissarthrum* Ashmead, new genus.
(Type, *Dimeris maculipennis* Ashmead, manuscript.)

7. Head transverse, the temples obliquely narrowed; recurrent nervure received by the first cubital cell......................(1133)) *Phænodus* Förster.

Tribe III. SPATHIINI.

1862. *Euspathiidæ*, Family 2, FÖRSTER, Verh. d. naturh. Ver. pr. Rheinl., XIX, pp. 227 and 236.
1885. *Spathiides* MARSHALL, Trans. Ent. Soc. Lond., p. 9.
1887. *Spathiinæ*, Subfamily, CRESSON, Syn. Hym. North America, p. 57.
1888. *Spathiidæ*, Tribe III, MARSHALL, Species des Hym. des Braconides, I, p. 65.
1900. *Spathiini*, Tribe III, ASHMEAD, Smith's Insects of New Jersey, p. 597.

This tribe is easily separated by the characteristic abdomen, which is always distinctly petiolate, the first segment being long and slender, the spiracles placed much before the middle. In the typical forms (*Spathius*) the front wings have three distinct cubital cells, the hind wings with a recurrent nervure and a complete submedian cell, which is a little shorter than half the length of the median cell.

Only two genera are known, separable as follows:

TABLE OF GENERA.

Head transverse-quadrate.. 2
Head quadrate or cubical.
  Second cubital cell much longer than first; recurrent nervure received by the second cubital cell at its lower hind angle............(1134) *Spathius* Nees.
2. Second cubital cell shorter than the first; recurrent nervure interstitial with the first transverse cubitus....................(1135) *Psenobolus* Reinhard.

Family LXXIX. STEPHANIDÆ.

1815. *Stephanida* LEACH, Edinb. Encyclop., IX, p. 142.
1839. *Stephanidæ*, Family 7, HALIDAY, Hym. Syn., p. ii.
1840. *Stephanidæ* SHUCKARD (part), Newman's Entom., I, p. 119.
1840. *Megalyridæ* SHUCKARD (part), Newman's Entom., I, p. 119.
1887. *Stephanidæ* CRESSON, Syn. Hym. North America, p. 52.
1900. *Stephanidæ*, Family LXXIX, ASHMEAD, Smith's Insects of New Jersey, p. 597.

In this family the costal cell in the front wings is distinct, as in the *Evaniidæ* and in the aculeate Hymenoptera, and this character readily distinguishes the family from the *Ichneumonidæ*, the *Alysiidæ* and the *Braconidæ*. From the *Evaniidæ* it is separated by the abdomen, which is attached normally, as in the *Ichneumonidæ*. Its other characters are peculiar: The head is most frequently globose, rugose, and tuberculous; the mandibles are protruding and form a kind of mouth opening, similar to some Braconids; the antennæ are long and slender and inserted far anteriorly, close to the clypeus, the scape subglose; the prothorax is rather long and narrowed into a neck anteriorly; the front wings have only one recurrent nervure and have a venation, except in having a distinct costal cell very similar to many of the Braconids, the hind wings most frequently being *without* distinct basal cells; the abdomen is elongate, the ovipositor being long; while the hind legs are robust, the coxæ large and long, nearly as long as their femora, which is considerably swollen and most frequently armed with a tooth or teeth beneath.

The cephalic and venational characters of this curious group recall those to be found in the family *Oryssidæ*, and I can not help but think the two families, in ages past, had a common ancestry.

TABLE OF GENERA.

Hind wings *without* basal cells.. 2
Hind wings *with* basal cells.
  Abdomen sessile, the first segment *not* longer than the second; posterior tarsi in both sexes normal, unarmed.

(1136) (1) *Schlettererius* Ashmead,[1] new genus=*Stephanus* Cresson, *nec* Jurine.
(Type, *Stephanus cinctipes* Cresson.)

2. Abdomen petiolate, or the first segment is long petioliform, as long or nearly as long as the rest of the segments united; hind femora short, swollen, and armed with teeth beneath, their tarsi variable, in female 3 or 4 jointed, in male 5-jointed; pronotum long.
(1137) (2) *Stephanus* Jurine=*Megischus* Brullé.

Abdomen sessile, the first segment *not* long; hind femora unarmed, their tarsi 5-jointed; pronotum short..................(1138) (3) *Megalyra* Westwood.

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[1] After Dr. August Schletterer, the monographer of the family.

GENERA UNKNOWN TO AUTHOR AND NOT CLASSIFIED.

Family BRACONIDÆ.

Cephaloplites Széplegeti, Termes. Fuzet., XX, 1897, p. 600.
Belongs to subfamily *Opiinæ*.

Curtisella Spinola, Mém. accad. sc. Torino, (2), XIII, 1851, p. 30.
Belongs possibly to tribe *Calyptini*.

Cyanopterus Wesmael, *teste* Kirchner, Cat. Hym. Eur., 1867, p. 115.
Description unknown to me and not found in Wesmael, as recorded by Kirchner. The genus is evidently identical with *Melanobracon* Ashmead, and, if described, has priority over that genus.

Euryzona Haliday, Ent. Mag., V, 1838, p. 5.
Belongs to the subfamily *Agathidinæ*. The name was suggested for a species from Australia, but since neither the species nor genus was ever characterized, the name should be dropped.

Gnathobracon Costa, Ann. Mus. Zool. Napoli, II, 1864, p. 69.

Heratremis Walker, Ann. and Mag. Nat. Hist., (3), V, 1860, p. 310.

Isomecus Kriechbaumer, Progr. Staatsgymn. Pola, 1895, p. 11.
Belongs to tribe *Rhogadini*. Description not seen by author, the publication not being in any of the libraries in Washington or Philadelphia.

Lysitermus Förster, Verh. d. naturh. Ver. pr. Rheinl., XIX, 1862, p. 2.

Nebartha Walker, Ann. and Mag. Nat. Hist., (3), V, 1860, p. 310.

Neotrimorus Dalla Torre, Wien. ent. Zeitg., XVII, 1898, p. 100.

Pseudovipio Széplegeti, Termes. Fuzet., XIX, 1896, pp. 167 and 230.

Psyttalia Walker, Ann. and Mag. Nat. Hist., (3), V, 1860, p. 311.

Spinaria Brullé, see p. 186.

Wesmaelella Spinola, Mém. accad. sci. Torino, (2), XIII, 1851, p. 32.

Family ICHNEUMONIDÆ.

Aglyptus Giraud, Ann. ent. Soc. France, (5), I, 1871, p. 411.

Amphibulus Kriechbaumer, Ent. Nachr., XIX, 1893, p. 122.

Anoplectis Kriechbaumer, Ent. Nachr., XXII, 1896, p. 363.

Branchopsis Kriechbaumer, Ent. Nachr., XII, 1886, p. 244.

Brachycystus Kriechbaumer, Corresp. Zool. mineral. Ver., in Regensburg, XXIV, 1880, p. 161.

Braunsia Kriechbaumer, Berl. ent. Zeitschr., XXXIX, 1894, p. 63.

Brischkea Kriechbaumer, Ent. Nachr., XXIII, 1897, p. 167.

Camptocentrus Kriechbaumer, Berl. ent. Zeitschr., XXXIX, 1894, p. 61.

Camptotypus Kriechbaumer, Ent. Nachr., XV, 1889, p. 311.

Cecidonomus Bridgman, Entom., XIII, 1880, p. 265.

Cratophion Thomson, Opus. Ent., XIII, 1889, p. 1363.

Cyrophio Thomson, Opus. Ent., XIII, 1889, p. 1367.

Dicksonia Holmgren, Nov. Species Ins., 1880, p. 11.

Diplomorphus Giraud, Ann. Soc. ent. France, (5) I, 1871, p. 409.

Dolichomitus Smith, Proc. Zool. Soc. Lond., 1877, p. 411.
Ectopius Wesmael, Mém. couron. ac. sci. Belg., 1859, p. 14.
Euryptilus Holmgren, Ichn. Suec., III, 1889, p. 375.
Goryphus Holmgren, Eng. Resa, Zool., I, 1868, p. 398, pl. VIII.
Griphodes Kriechbaumer, Termes. Fuzet., 1894, p. 57.
Hereterolabis Kriechbaumer, Ent. Nachr., XV, 1899, p. 18.
Idiostolus Förster, Verh. d. naturh. Ver. pr. Rheinl., XXV, 1868, p. 190.
Labium Brullé, Hist. Nat. des Ins. Hym., IV, 1846, p. 316.
Lasiophorus Haliday, Ent. Mag., V, 1838, p. 5.
Leptobatides Du Buysson, Andrés' Species Hym. d'Eur., VI, 1896, p. 678.
Liogaster Kriechbaumer, Ent. Nachr., XVI, 1890, p. 297.
Matara Holmgren, Eng. Resa, Zool., I, 1868, p. 395.
Microleptes Gravenhorst, Ichn. Eur., I, 1829, p. 679.
Nemioblastus Thomson, Opus. Ent., IX, 1883, p. 901.
Ophiodes Hartig, Jahresb. der Forstwiss. u. Forst. naturk., 1840.
Opisoneura Kriechbaumer, Berl. ent. Zeitschr., ——.
Oresbius Marshall, Ent. Mo. Mag., III, 1867, p. 193.
Orotylus Holmgren, Ichn. Suec., III, 1889, p. 405.
Perissocerus Smith, Proc. Zool. Soc. Lond., 1877, p. 412.
Scambus Hartig, Jahresb üb. d. Forstschr. d. Forst. naturk., 1838, p. 267.
Sirbiriakoffia Holmgren, Nov. Species Ins., 1880, p. 13.
Sphaetes Breme? Publication unknown to author.
Sphecophaga Westwood, Intro. mod. class. Ins., II, 1840, Synop., p. 57.
Tricholabis Thomson, Opus. Ent., XVII, 1894, pp. 2102 and 2113.
Westwoodia Provancher *nec* Brullé, Nat. Can., VII, 1875, p. 329.
Xaniopelma Tschek, Verh. zool.-bot. Gesell. in Wien., XVIII, 1868, p. 443.
Xylophylax Kriechbaumer, Ent. Nachr., IV, 1878, p. 210.

GENERA INCORRECTLY PLACED WITH THE ICHNEUMONOIDEA.

Arotropus Provancher (=Stigmatomma Roger), Fn. du Can. Hym., II, 1883, p. 538.
Belongs to the family *Poneridæ*. (Formicoidea.)

Callipteroma Motschulsky (=Calliopteroma Dalla Torre), Bull. Soc. natural. Moscou, XXXVI, 1863, p. 35; Dalla Torre, Cat. Hym., IV, 1898, p. 307.
Belongs to the family *Encyrtidæ*. (Chalcidoidea.)

Copelus Provancher (=Helorus Latreille), Fn. du Can. Hym., II, 1883, p. 540.
Belongs to the family *Heloridæ*. (Proctotrypoidea.)

Monomachus Westwood, Ann. and Mag. Nat. Hist., VII, 1841, p. 535; Schletterer, Berl. Ent. Zeitschr., XXXIII, 1889, p. 209.
Belongs to the family *Heloridæ*. (Proctotrypoidea.)

Olixon, Cameron, Biol. Centr.-Amer. Hym., I, 1887, p. 413; Dalla Torre, Cat. Hym., IV, 1898, p. 307.
Belongs to the family *Bethylidæ*. (Vespoidea.)

Rhopalosoma Cresson (=Sibillina Westwood), Proc. Ent. Soc. Phil., IV, 1865, p. 58; Dalla Torre, Cat. Hym., IV, 1898, p. 307.—*Sibillina* Westwood, Trans. Ent. Soc. Lond., 1868, p. 329.—*Sibyllina* Dalla Torre, Cat. Hym., IX, 1894, p. 113.—Rhopalosoma Ashmead, Proc. Ent. Soc. Wash., III, 1895 [1896], p. 303.
Represents the type of the family *Rhopalosomidæ* Ashmead. (Vespoidea.)

Roptronia Provancher, Add. Fn. du Can. Hym., 1886, p. 54; Dalla Torre, Cat. Hym., IV, 1898, p. 1.—Ashmead, Proc. Ent. Soc. Wash., IV, 1897 [1898], p. 132.
Belongs to the family *Heloridæ*. (Proctotrypoidea.)

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SYNOPSES OF THE FAMILIES OF THE HYMENOPTERA.

Suborder I. HETEROPHAGA.

Superfamily I. APOIDEA.

TABLE OF FAMILIES.

Labium, or tongue, flattened, most frequently shorter than the mentum, rarely much longer (some *Panurgidæ*); basal joints of labial palpi cylindrical, the first joint sometimes very elongate or thickened, but still neither flattened nor unlike the following joints.............. 6

Labium, or tongue, very elongate, slender, and always longer than the mentum; two basal joints of labial palpi very elongate, compressed, valvate, and very unlike the following, which are minute, the third joint uniting with the second a little before its apex.

Hind tibiæ *with* two apical spurs.................................. 2

Hind tibiæ *without* apical spurs.

Sexes three, female, worker, male; workers with corbiculæ, the female *without*; maxillary palpi very short, 1-jointed (rarely indistinctly 2-jointed from a slight constriction); labial palpi 4-jointed, with the joints very unequal, the first two long, valvately compressed.
Family I. Apidæ.

2. First cubital cell not, or rarely, divided by a delicate, oblique nervure; if at all present, incomplete or indicated by a hyaline streak or nervure; sexes two; female and male; hind tibiæ in female convex or rounded, never concave; no corbiculæ; basal joint of hind tarsi in female not forcipate at base; malar space except in the *Psithyridæ*, wanting or indistinct, never very large 3

First cubital cell most frequently divided by a distinct, but delicate, oblique nervure, rarely indistinct; hind tibiæ and metatarsi in female strongly dilated, outwardly concave; metatarsus in female forcipate; malar space large, distinct.

Labrum transverse, subtrapezoidal, the clypeus *not* carinate; body densely hairy; scutellum semicircular, rounded off posteriorly, and not projecting over the metanotum; sexes three, female, worker, male; female and worker with corbiculæ and a dense polleniferous scopa on hind tibiæ and tarsi; labial palpi 4-jointed; maxillary palpi short, 2-jointed; tongue not extending beyond the apex of thorax.
Family II. Bombidæ.

Labrum large, subquadrate, the clypeus, and frequently the labrum also, carinate; body most frequently metallic, bare or nearly, rarely very densely pubescent (*Eulema*); scutellum large, quadrangular, projecting over the metanotum, the axillæ very small; sexes two, female, male; female with corbiculæ, but with the polleniferous scopa on hind tibiæ and tarsi very sparse, or thin and confined to

the lateral edges; labial palpi 2-jointed; maxillary palpi 1-jointed; tongue reaching to or beyond the middle of the abdomen.
Family III. EUGLOSSIDÆ.

3. Front wings with *two* cubital cells, the second sometimes incomplete.......... 5

Front wings with *three* cubital cells.

Eyes extending to or nearly to the base of the mandibles, the malar space wanting, or at most not longer than the pedicel of antennæ...... 4

Eyes not nearly extending to the base of the mandibles, the malar space large, distinct, longer than the pedicel, and first joint of flagellum united.

Marginal cell very long, as long or longer than the three cubital cells united; body rather densely pubescent; abdomen broadly oval or oblong, flat beneath, convex above; female *without* corbiculæ or polliniferous scopa; male with eyes frequently strongly convergent above, the genitalia, squama, and lacinia always membranous.
Family IV. PSITHYRIDÆ.

4. Labrum large, free, convex, or inflexed.

Marginal cell neither especially long nor narrow, rarely longer than the first two cubital cells united.

Female *with* a dense polleniferous scopa on hind tibiæ and tarsi; body clothed with a dense pubescence; maxillary palpi 2- to 6-jointed.
Family V. ANTHOPHORIDÆ.

Female *without* a polleniferous scopa, at most with a thin, sparse flocculus on hind tibiæ and tarsi; body most frequently bare, or nearly; the pubescence, if any, short and sparse, rarely densely pubescent; species often metallic or rufous and black, the abdomen usually ornate, with white or yellow maculæ or bands.
Family VI. NOMADIDÆ.

Marginal cell long and narrow, usually as long or longer than the three cubital cells united.

Hind tibiæ and tarsi with a sparse pubescence, but *without* a distinct scopa; maxillary palpi 4- to 6-jointed; body usually metallic or submetallic, nearly bare; abdomen elongate, subcylindrical, the segments more or less constricted at sutures. Small species.
Family VII. CERATINIDÆ.

Hind tibiæ and tarsi with a dense scopa; maxillary palpi usually 4- to 6-jointed (rarely wanting); thorax more or less densely pubescent, or at least laterally; abdomen not elongate, oblong-oval, with a ventral scopa; eyes in males often convergent above.. Family VIII. XYLOCOPIDÆ.

5. Labrum large and free, uncovered; maxillary palpi 4-, 5-, or 6-jointed (rarely wanting); body densely pubescent; ventral scopa present, the hind legs with a dense scopa.

Marginal cell neither long nor narrow..... Family V. ANTHOPHORIDÆ (part).

Marginal cell very long and narrow ...... Family VIII. XYLOCOPIDÆ (part).

Labrum not large and free, most frequently entirely covered by the clypeus (*Megachilidæ*); or, if sometimes visible, then strongly inflexed (*Stelididæ*).

Abdomen in female *with* a ventral scopa; labrum entirely covered by the clypeus .... Family IX. MEGACHILIDÆ.

Abdomen in female *without* a ventral scopa; labrum more or less visible, not entirely covered by the clypeus, strongly inflexed.
Family X. STELIDIDÆ.

6. Labium, or tongue, short, broad, obtuse or emarginate at apex, never acute medially; hind femora with or without a distinct pollen brush or flocculus 7

Labium, or tongue, long or short, but always acute medially at apex; hind femora always with a pollen brush or flocculus, rarely very thin and sparse.

Front wings with *two* cubital cells; labium long or short, usually, however, narrowed and longer than the mentum; labrum rather large, distinct, not covered by the clypeus, most frequently inflexed.
Family XI. PANURGIDÆ.

Front wings with *three* cubital cells; labium shorter, not longer than the mentum, triangular, not narrowed, rarely long; labrum not free, more or less hidden by the clypeus, or with the basal process alone visible.
Family XII. ANDRENIDÆ.

7. Front wings with *three* cubital cells; head and thorax more or less clothed with a dense pubescence; second recurrent nervure often more or less sinuate; labium at apex rather deeply triangularly emarginate; hind femora in female *with* a pollen brush or flocculus.
Family XIII. COLLETIDÆ.

Front wings with *two* cubital cells; head and thorax bare, or nearly; second recurrent nervure always straight; labium very short and broad, shallowly or very obtusely triangularly emarginate at apex; hind femora in female *without* a pollen brush or flocculus.
Family XIV. PROSOPIDÆ.

Superfamily II. SPHECOIDEA.

TABLE OF FAMILIES.

Middle tibiæ always with *two* apical spurs 5

Middle tibiæ with only *one* apical spur (occasionally absent in some males).

Median cell in hind wings not twice as long as the submedian, the latter often the longer; front wings with two or three cubital cells; if with one only the head transverse, not quadrate 2

Median cell in hind wings fully twice as long as the submedian; front wings with only one cubital cell, very rarely with an indistinctly defined areolet.

Head transverse, the temples not very broad; scutellum margined, the postscutellum armed with a spine, thorn, or forked process, and with squamæ; front wings with the first discoidal cell obliterated, rarely distinct, most frequently confluent with the second discoidal cell....................................Family XV. OXYBELIDÆ.

Head large, quadrate or trapezoidal, the temples very broad; scutellum normal, the postscutellum unarmed, without squamæ; front wings with the first discoidal cell always distinct, separated from the second................................Family XVI. CRABRONIDÆ.

2. Abdomen with a strong constriction between the first and second segments; eyes often emarginate within 4

Abdomen without a strong constriction between the first and second segments; eyes most frequently normal, rarely emarginate within.

Abdomen sessile, never petiolate 3

Abdomen petiolate or subpetiolate; cubitus in hind wings usually originating before the transverse median nervure, more rarely interstitial or originating slightly beyond it; transverse median nervure not sinuate ꙅ-shaped; ocelli distinct; labrum most frequently hidden, rarely triangularly exserted, never free.
Family XVII. PEMPHREDONIDÆ.

3. Labrum large, free, well developed, and triangularly elongated, much longer than wide; cubitus in hind wings usually originating beyond the transverse median nervure, the latter sinuate or somewhat ∫-shaped; ocelli aborted, represented by cicatrices.
Family XVIII. Bembicidæ.

Labrum small, not free, usually completely hidden by the clypeus; cubitus in hind wings most frequently originating beyond the transverse median nervure, the latter straight, not ∫-shaped; mandibles often emarginate on under side; ocelli distinct, or at most with the lateral or hind ocelli aborted or wanting, indicated by cicatrices; front wings with a distinct stigma..................Family XIX. Larridæ.

4. Head wider than the thorax, the temples not narrow, rather broad; eyes most frequently normal, rarely deeply emarginate within, although often slightly emarginate within; abdomen most frequently sessile or subsessile, rarely petiolate (*Tachypus* Klug), not elongate, ovate or oblong-oval, and most frequently with a deep constriction between the segments, or at least always with a constriction between the first and second; front wings with three cubital cells, the second often petiolate, the second and third each receiving a recurrent nervure; cubitus in hind wings variable, inerstitial or nearly, originating far beyond the transverse median nervure.
Family XX. Philanthidæ.

Head not wider than the thorax, the temples very narrow or flat; eyes always deeply emarginate within, or reniform; abdomen elongate, clavate, the first segment elongate, petioliform; front wings with one or two cubital cells, the second, however, usually more or less indistinct or subobsolete; cubitus in hind wings originating beyond the transverse median nervure ....Family XXI. Trypoxylidæ.

5. Abdomen without a constriction between the first and second segments; intermediate coxæ not contiguous.................................... 6

Abdomen with a more or less distinct constriction between the first and second segments, the first segment coarctate; intermediate coxæ contiguous; mesosternal suture wanting ....Family XXII. Mellinidæ.

6. Mesosternum produced into a forked process posteriorly; mesepisternum not separated; mesonotum with distinct parapsidal furrows.......... 8

Mesosternum normal, not produced into a forked process posteriorly; mesepisternum separated; mesonotum without parapsidal furrows, or at most only vaguely defined.

Abdomen distinctly petiolated 7

Abdomen sessile or subsessile.

Labrum not free, entirely covered by the clypeus, or at most with only its apex visible; cubitus in hind wings originating *before* the transverse median nervure, rarely slightly beyond it, the latter most frequently straight, rarely sinuate or somewhat ∫-shaped.
Family XXIII. Nyssonidæ.

Labrum free, well developed, subtrianguar or semicircular, wider than long; cubitus in hind wings originating usually before the transverse median nervure, the latter strongly sinuate or somewhat ∫-shaped; ocelli distinct................Family XXIV. Stizidæ.

7. Clypeus never produced posteriorly between the antennæ, the latter inserted above the base of the clypeus; metathorax most frequently rounded posteriorly, very rarely with acute angles; cubitus in hind wings variable, most frequently originating *beyond* the transverse median nervure, more rarely interstitial ....Family XXV. Sphecidæ.

8. Clypeus posteriorly usually carinate or produced between the insertion of the antennæ so that its basal margin is beyond a line drawn from their base; anteriorly it is often rostriform carinate, or at least more or less produced medially; metathorax usually long, abruptly truncate posteriorly with the angles acute or toothed, although sometimes the angles are rounded; pronotum rather long, conically produced.
Family XXVI. AMPULICIDÆ.

Superfamily III. VESPOIDEA.

TABLE OF FAMILIES.

Abdomen either sessile or petiolate, with the first ventral segment distinctly separated from the second by a more or less deep *constriction* or *transverse* furrow; legs most frequently fossorial.......................... 5

Abdomen either sessile or petiolate, but the second ventral segment *not* separated from the first by a strong constriction or transverse furrow; if somewhat constricted, then the legs are *not* fossorial and the wings are usually folded in repose; in the former case the legs may be either fossorial or simple.

Posterior legs usually short, the femora rarely reaching to or at least extending much beyond the middle of the abdomen; legs most frequently not fossorial 2

Posterior legs long, the femora most frequently reaching to or beyond the tip of the abdomen; tibiæ in female most frequently serrate or spinous, more rarely entirely smooth; middle tibiæ with two apical spurs.
Family XXVII. POMPILIDÆ.

2. Wings not folded in repose; female sometimes apterous 3

Wings folded in repose; never apterous.

Claws simple; middle tibiæ with two apical spurs; sexes three, female, worker, male ....Family XXVIII. VESPIDÆ.

Claws with one or more teeth beneath; middle tibiæ with one or two apical spurs; sexes two, female and male.....Family XXIX. EUMENIDÆ.

3. Metathoracic angles usually acutely produced, the metanotum posteriorly concave; scutellum large, flat, convex, conical, or spined; if the metathoracic angles are rounded, which occurs rarely, the abdomen has only from 3 to 5 visible segments.

Abdomen normal, with at least 6 distinct segments, the venter flat; antennæ usually strongly clavate, in female knobbed at apex; scutellum very large, flat; species *not* metallic; antennæ never more than 12-jointed.
Family XXX. MASARIDÆ.

Abdomen abnormal, with from 3 to 5 visible segments, the terminal segments most frequently retractile, telescopic-like, the venter concave or flat; species metallic; antennæ most frequently filiform, inserted close to the anterior border of the head, 13-jointed; scutellum convex, conical, or spined, rarely flat........Family XXXI. CHRYSIDIDÆ.

Metathoracic angles rarely toothed or acutely produced, the metanotum posteriorly squarely truncate or rounded, not concave; scutellum normal, or in some wingless females entirely absent; antennæ filiform or subclavate, rarely flabellate in some males; abdomen always with more than 5 dorsal segments.

Hind wings *with* a distinct venation, and always *without* anal lobes; females never apterous 4

Hind wings *without* a distinct venation, and always *with* an anal lobe; females often apterous; middle tibiæ with two apical spurs; antennæ, 10- to 26-jointed........................Family XXXII. BETHYLIDÆ.

4. Trochanters 2-jointed; middle tibiæ with *two* apical spurs; eyes normal, *not* emarginate within; antennæ long, filiform, 15-jointed or more, similar in both sexes..................Family XXXIII. TRIGONALIDÆ.

Trochanters 1-jointed; middle tibiæ with *one* apical spur; eyes reniform or emarginate within; antennæ in female 12-jointed, in male 13-jointed. Family XXXIV. SAPYGIDÆ.

5. Middle coxæ contiguous or nearly 7

Middle coxæ distant, usually widely separated 6

6. Stigma in the front wings *not* well developed, at the most only slightly developed, either very small or linear; eyes most frequently emarginate within; middle tibiæ with two apical spurs.

Pygidium in male deeply emarginate at apex, the hypopygium terminating in a sharp thorn or aculeus, which curves upward and rests in the emargination of the pygidium; claws cleft. Family XXXV. MYZINIDÆ.

Pygidium in male entire, or at most with only a slight sinus, the hypopygium terminating in three spines; claws simple. Family XXXVI. SCOLIIDÆ.

Stigma in front wings well developed, ovate or subovate; eyes entire, never emarginate within; pygidium in male entire, the hypopygium terminating in a sharp aculeus, which curves upward. Family XXXVII. TIPHIIDÆ.

7. Females always apterous, and frequently, but not always, without ocelli; eyes variable 9

Females always winged, with ocelli; eyes large, always extending to base of mandibles 8

8. Abdomen sessile or subsessile, and often with a more or less distinct constriction between dorsal segments 1 and 2; front wings with the stigma well developed, the marginal cell usually attaining the costa at apex (rarely rounded or truncate at apex, with a slight space between *Cosila* and allies); hind wings usually without an anal lobe, the cubitus either interstitial or originating beyond the transverse median nervure, very rarely originating before it; tibial spurs 1, 2, 2; tarsal joints normal; eyes entire; ocelli normal; hypopygium entire, not ending in a spine or an aculeus. Family XXXVIII. COSILIDÆ.

Abdomen longly petiolate; front wings with the stigma small, not well developed, the second recurrent nervure subobsolete; hind wings bilobed, the cubitus originating far beyond the transverse median nervure; tibial spurs very long, straight; tarsal joints 2–3 in female dilated, deeply excised or lobed, and filled with a membrane between the lobes; eyes emarginate within; ocelli very large; antennæ very long, filiform, the joints with a bristle-like spine at apex. Family XXXIX. RHOPALOSOMIDÆ.

9. Middle tibiæ with two apical spurs, rarely with one only, or none in some males.

Middle coxæ usually slightly separated by a triangular or bilobed projection of the mesosternum; females with the thorax divided into three parts, the pygidium usually subcompressed or otherwise formed, usually abnormal; hypopygium in male most frequently armed. Family XL. THYNNIDÆ.

Middle coxæ contiguous, not separated by a triangular or bilobed projection of the mesosternum, the latter being squarely truncate at apex.

Thorax in the female divided into two parts; pygidium normal; hypopygium in male produced into a sharp aculeus, which curves upward (very rarely simple, unarmed); hind wings *with* a distinct anal lobe, the cubitus originating from the apex of the submedian cell, interstitial with the transverse median nervure, or rarely originating beyond it ....Family XLI. MYRMOSIDÆ.

Thorax in female undivided, all the parts being closely united or soldered together, and *without* visible sutures between; pygidium normal; hypopygium in male simple, unarmed, but the genital plate is armed with two slender, straight spines, which project more or less distinctly from the tip of the abdomen; hind wings *without* an anal lobe, the cubitus originating far *before* the transverse median nervure ....Family XLII. MUTILLIDÆ.

Superfamily IV. FORMICOIDEA.

TABLE OF FAMILIES.

Abdomen with the petiole composed of a single joint or node, never with a constriction between segments 2 and 3 4

Abdomen with the petiole composed of two joints, nodes, or scales, or if with one, with a strong constriction between segments 2 and 3. Females and workers with the sting well developed; orifice of the cloaca slit or cleft.

Middle and posterior tibiæ *with* apical spurs.............................. 2

Middle and posterior tibiæ *without* apical spurs 3

2. Males without cerci; subgenital plate semicircularly emarginate, ending in two prongs; genital organs wholly retractile; frontal carinæ close together, nearly vertical, not at all covering the base of the antennæ. Family XLIII. DORYLIDÆ.

Males with cerci; subgenital plate never ending in two prongs; genital organs, except in a single case, not wholly retractile; frontal carinæ most frequently remote; if close, they are usually dilated anteriorly in an oblique or horizontal lamina, and cover in part the insertion of the antennæ.

Petiole 1-jointed, but there is always a constriction between segments 2 and 3; pupæ covered with a cocoon .... Family XLIV. PONERIDÆ.

Petiole with 2 joints or nodes; pupæ naked, without a cocoon. Family XLV. MYRMICIDÆ.

3. Male genital organs prominent; clypeus viewed from in front triangular, subtriangular, or semicircular, and always prolonged posteriorly between antennæ. (Leaf-cutting ants; all fungus growers.) Family XLVI. CRYPTOCERIDÆ.

4. Mandibles linear, parallel, articulated at or near the middle of the anterior margin of the head, in male very small or rudimentary; eyes in males very large, occupying most of the sides of the head; front wings with three cubital cells; females and workers with the sting well developed; orifice of cloaca slit or cleft. Family XLVII. ODONTOMACHIDÆ.

Mandibles articulated normally toward the anterior lateral angles of the head, never linear, parallel, nor very small; rudimentary in males; eyes not especially large.

Male genital organs not retractile, rarely very large, except in *Liometopum;* workers and females with a rudimentary sting; orifice of cloaca slit or cleft; pupæ without cocoons.
Family XLVIII. DOLICHODERIDÆ.

Male genital organs most frequently exserted, the hypopygium obtusely triangular or rounded at apex; workers and females without a sting; orifice of cloaca round, terminal, surrounded with a fringe of hairs; pupæ usually covered with a cocoon...Family XLIX. FORMICIDÆ.

Superfamily V. PROCTOTRYPOIDEA.

TABLE OF FAMILIES.

Trochanters distinctly 2-jointed.. 2
Trochanters 1-jointed.
Antennæ 14-jointed, inserted on the middle of the face; front wings with a lanceolate stigma, the marginal cell long, open at apex; maxillary palpi 5-, labial palpi 3-jointed; female abdomen very greatly lengthened, slender and cylindrical, about five times the length of the head and thorax united, composed of 6 segments; male abdomen clavate ....Family L. PELECINIDÆ.

2. Antennæ inserted at the clypeus.. 5
Antennæ inserted on the middle of the face, often on a frontal prominence.
Wingless forms.. 4
Winged.
Front wings with the marginal vein linear, never stigmated............ 3
Front wings with the marginal vein stigmated, or with a distinct stigma.
Mandibles dentate; antennæ 14–15 jointed; claws simple or pectinate; hind wings *with* a more or less distinct venation.
Family LI. HELORIDÆ.
Mandibles edentate; antennæ 13-jointed, with a ring joint; claws simple; hind wings *without* a distinct venation.
Family LII. PROCTOTRYPIDÆ.

3. Front wings with a distinct basal cell and usually with a marginal cell often closed, never entirely wanting, although often incomplete; hind wings always with a basal cell; antennæ 14–15-jointed; labial palpi 3-jointed ....Family LIII. BELYTIDÆ.
Front wings rarely with a distinct basal cell, the median vein most frequently obsolete or subobsolete, the marginal cell never complete, usually entirely wanting; hind wings always *without* a basal cell; antennæ 12, 13, or 14 jointed; labial palpi 2-jointed.
Family LIV. DIAPRIIDÆ.

4. Mandibles edentate................................Family LII. PROCTOTRYPIDÆ.
Mandibles dentate.
Labial palpi 3-jointed ....Family LIII. BELYTIDÆ.
Labial palpi 2-jointed ....Family LIV. DIAPRIIDÆ.

5. Wingless forms.. 7
Winged.
Abdomen acute or margined along the sides, sessile or subsessile............ 6
Abdomen rounded at sides, never acute or margined, sessile or subsessile; front tibiæ with the apical spur strongly forked; antennæ in female 10–11 jointed, in male 11-jointed; front wings always without a postmarginal vein, the stigmal vein or radius usually long, the marginal vein either linear or stigmated........Family LV. CERAPHRONIDÆ.

6. Front wings most frequently with marginal and stigmal veins; antennæ usually 12-jointed in both sexes, but sometimes in female 11-jointed, or 7-jointed when the club joints coalesce ..Family LVI. SCELIONIDÆ.

Front wings always *without* marginal and stigmal veins, and most frequently veinless, at the most with only the submarginal or subcostal vein present, which is sometimes clavate or stigmated at apex; antennæ never more than 10-jointed, usually with the same number of joints in both sexes (rarely only 8 or 9 jointed).
Family LVII. PLATYGASTERIDÆ.

7. Abdomen never acute or margined along the sides; anterior tibiæ with the apical spur strongly forked.................Family LV. CERAPHRONIDÆ.

Abdomen with the sides acute or margined; anterior tibiæ with one apical spur.

Antennæ 12-jointed or if with a solid club, 7-jointed; labial palpi 2-jointed.
Family LVI. SCELIONIDÆ.

Antennæ 10-jointed (rarely less); labial palpi 1-jointed.
Family LVII. PLATYGASTERIDÆ.

Superfamily VI. CYNIPOIDEA.

TABLE OF FAMILIES.

Abdominal tergites meeting along the venter and entirely inclosing or concealing the sternites, at most with only a part of the hypopygium exposed.
Family LVIII. FIGITIDÆ.

Abdominal tergites *not* meeting along the venter; all or nearly all the sternites visible................................Family LIX. CYNIPIDÆ.

Family LVIII. FIGITIDÆ.

TABLE OF SUBFAMILIES.

Abdomen short, globose or subglobose, the second segment the longest........ 3

Abdomen ovate, compressed or subcompressed, often longly petiolated, the apex usually pointed.

Scutellum cupuliform, i. e., with a cup-like elevation on its disk........... 2

Scutellum not cupuliform, of ordinary shape or grooved, spined, or cone-shaped, and usually foveate at base.

Abdomen sessile or subsessile or with a short petiole, the second segment shorter than the third.

Second abdominal segment *not* prolonged dorsally, as seen from the side, not tongue-shaped.................Subfamily I. FIGITINÆ.

Second abdominal segment prolonged dorsally, as seen from the side, tongue-shaped........................Subfamily II. ONYCHIINÆ.

Abdomen longly petiolated, the second segment usually somewhat longer than the third.

Petiole attached to the metathorax normally, between the hind coxæ; fourth segment not longer than either the second or the third.
Subfamily III. ANACHARINÆ.

Petiole attached to the metathorax far above the hind coxæ; fourth segment much longer than either the second or the third.
Subfamily IV. LIOPTERINÆ.

2. Second abdominal segment always the longest and usually occupying most of the surface of abdomen; hind tibiæ with *two* apical spurs.
Subfamily V. EUCŒLINÆ.

3. Scutellum rounded, smooth, convex; hind tibiæ with only *one* apical spur.
Subfamily VI. ALLOTRIINÆ.

Family LIX. CYNIPIDÆ.

TABLE OF SUBFAMILIES.

Basal joint of hind tarsi at least twice as long as all the others united; joints 2 to 4 scarcely longer than wide, the second with a long-spined process outwardly 2

Basal joint of hind tarsi usually shorter than joints 2 to 5 united, or never much longer; abdomen not or very little longer than the head and thorax united.

Second and third abdominal segments in female closely united and occupying the whole or nearly the whole surface of the abdomen, very rarely showing an indistinct dividing suture between; if the suture is present, it is very oblique and the segment dorsally is fully two-thirds the length of the abdomen; male sometimes with the second and third abdominal segments subequal, but these segments occupy most of the surface of abdomen; venter more or less completely covered basally........................Subfamily I. SYNERGINÆ.

Second and third abdominal segments, in female and male, well separated and rarely occupying much more than half the whole surface of abdomen; segment 3 in male never longer than half the length of the first dorsally, the second segment being usually as long as all the following segments united; venter always visible.
Subfamily II. CYNIPINÆ.

2. Abdomen very strongly compressed, cultriform, and much longer than the head and thorax united, the four or five basal segments nearly of an equal length ....Subfamily III. IBALIINÆ.

Superfamily VII. CHALCIDOIDEA.

TABLE OF FAMILIES.

Hind wings exceedingly narrow, linear, peduncle at base; ovipositor issuing from beneath just anterior to tip of abdomen; antennæ without a ring-joint, the scape rather small, short, compressed................ 12

Hind wings never very narrow, nor linear, not pedunculate at base; ovipositor issuing far anterior to the tip of abdomen; antennæ elbowed, with 1, 2, or 3 ring-joints, very rarely without, the scape large and rather long.

Axillæ triangularly produced or advanced forward into the basal region of the scapulæ, their base or anterior margin *on* or *in advance* of an imaginary line drawn from tegula to tegula; anterior tibial spur most frequently small or weak; tarsi 3–4-jointed, rarely 5-jointed or heteromerous.. 10

Axillæ normal, or at least never produced forward into the basal region of the scapulæ, their base or anterior margin straight and always back of an imaginary line drawn from tegula to tegula; anterior tibial spur large and strong; tarsi 5-jointed (rarely 4-jointed, or 3 or 4 jointed in some wingless males).............................. 3

3. Head in female oblong, with a deep, broad longitudinal furrow above, the occipital margin superiorly, usually with a small recurved tubercle or spine at its middle; mandibles or palpi most frequently furnished with saw-like appendages; anterior and posterior legs very stout, their tibiæ very much shorter than their femora, the middle legs very slender, sometimes aborted; hypopygium very prominent,

acute, cultriform or lanceolate; ovipositor long, prominently exserted; male always apterous, the head anteriorly with a deep triangular fovea, in which are placed the short 3–9-jointed antennæ; the abdomen in the male is always long and tubular, thickened at base.
Family LX. AGAONIDÆ.

Head rarely oblong and quite differently formed, never with a deep broad longitudinal furrow above, most frequently transverse, or subquadrate, the occipital margin never with a small recurved spine; mandibles and palpi without saw-like appendages; middle legs not especially slender, the anterior and posterior legs are often stout, but their tibiæ are always longer, at least never shorter, than their femora; hypopygium rarely very prominent; male most frequently winged, rarely apterous; in the latter case the abdomen is normal, not long and tubular.

Mesopleura large, entire, without a femoral furrow, except occasionally in some males, the mesepisternum large, triangular, not extending to base of front coxæ; middle tibial spur saltatorial, most frequently long and stout, or dilated at base.......................... 8

Mesopleura always with a femoral furrow or impression, the mesepisternum variable, rarely large, except in the *Cleonymidæ*, most frequently small, wedge-shaped, or linear and extending to base of front coxæ; if large and triangular, either the anterior or posterior femora are much swollen; middle tibial spur not saltatorial, usually short or weak, never very stout.

Hind tibiæ with 2 apical spurs, rarely with 1 only; in the latter case the radius terminates in a large, rounded stigma, the ovipositor very long.. 4

Hind tibiæ with 1 apical spur; ovipositor rarely long, if long the stigma is small.. 9

4. Mandibles falcate, usually with 1 or 2 teeth within; thorax most frequently very gibbous, the scutellum usually very large, often abnormally developed, elevated and produced posteriorly, the axillæ connate, not distinctly separated from the surrounding surface and broadly united along their inner margins 6

Mandibles usually 3–4 dentate at apex; rarely falcate, with 1 or 2 teeth within; thorax not or very slightly gibbous, the axillæ distinctly separate, their inner margins most frequently widely separated, very rarely touching.

Hind coxæ rarely much larger than the anterior coxæ, most frequently smaller or equal; if much larger, the pronotum is elongate, mesepisternum large, the hind legs very long, the postmarginal vein very long; ovipositor very rarely prominent.......................... 5

Hind coxæ very large and long, usually five or six times larger than the anterior coxæ.

Hind coxæ subtriquetrous, or at least compressed into a sharp ridge above; hind femora never very much swollen, and most frequently simple, rarely with one large tooth or denticulate beneath; abdomen most frequently subcompressed (more rarely depressed), with a long ovipositor; if without an exserted ovipositor, the abdomen is conical or conic-ovate with a peculiar sculpture, the radius (stigmal vein) usually very short, the hind tibiæ at apex normal.
Family LXI. TORYMIDÆ.

Hind coxæ usually very long and subcylindrical, rarely triquetrous; hind femora always much swollen and most frequently armed with teeth beneath or finely serrated, rarely without teeth; abdomen of various shapes, most frequently conical or conic-ovate, more rarely globose, or oblong oval, the ovipositor very rarely prominent; radius variable, rarely very short; hind tibiæ strongly curved and obliquely truncately produced at apex, so that the tarsi seem to be attached a little before tips ....Family LXII. CHALCIDIDÆ.

5. Pronotum rarely transverse-quadrate, conical or conically produced anteriorly, or very short, transverse, and very much narrowed medially, rarely as wide as the mesonotum 7

Pronotum large quadrate or transverse quadrate, never very short, if somewhat shortened always as wide as the mesonotum.

Pronotum quadrate or subquadrate; abdomen in female not triangulated, globose, ovate, conic-ovate, or lanceolate and compressed or subcompressed, the hypopygium most frequently prominent plowshare shaped; second dorsal segment never very large; mandibles not strong, most frequent 4-dentate.......Family LXIII. EURYTOMIDÆ.

Pronotum shorter, more transverse, and as wide as the mesonotum; abdomen in female most frequently triangulated, or globose, the second and third segments occupying most of the dorsal surface, the following very short and more or less retracted within the third; hypopygium not prominent; mandibles 2 or 3 dentate at apex.
Family LXIV. PERILAMPIDÆ.

6. Second abdominal segment very large and most frequently inclosing the following; coxæ not large, subglobose, nearly equal; all legs very slender; radius scarcely developed, its stigma sessile or subsessile.
Family LXV. EUCHARIDÆ.

7. Mesepisternum not large, triangular; anterior femora never much swollen, the posterior femora also normal or only slightly swollen; marginal vein in hind wings usually long, the costal cell not reaching to the hooklets or spinulæ and most frequently very narrow; radius well developed ....Family LXVI. MISCOGASTERIDÆ.

Mesepisternum large, triangular; either the anterior or the posterior femora are much swollen and sometimes toothed, or both are swollen with the hind femora toothed; if with slender legs, the hind legs are very long, their coxæ long, cylindrical, while the radius (stigmal vein) in front wings is very short, with the postmarginal vein very long, extending to the apex of the wing (*Pelecinella* Westwood).
Family LXVII. CLEONYMIDÆ.

8. Mesonotum either depressed, with more or less distinct parapsidal furrows, the scapulæ longitudinally ridged, or convex or subconvex, entirely without furrows, rarely convex with distinct furrows; axillæ most frequently meeting at inner basal angles, rarely very widely separated ....Family LXVIII. ENCYRTIDÆ.

9. Mesonotum subconvex with incomplete or complete parapsidal furrows; hind coxæ rarely much larger than the front coxæ; axillæ separated, not meeting at inner basal angles; mesepisternum usually small, wedge-shaped, or triangular; hind wings with a long marginal vein; mandibles usually stout, 3 or 4 dentate at apex.
Family LXIX. PTEROMALIDÆ.

10. Hind coxæ normal; mesopleura impressed 11

Hind coxæ abnormally large and dilated, their femora flat or compressed; tarsi very long; mesopleura entire, not impressed; marginal vein in front wings most frequently extraordinarily lengthened, the radius very short, scarcely dilated; mesonotum without furrows.
Family LXX. ELASMIDÆ.

11. Tarsi 4–5 jointed, rarely heteromerous; anterior wings not short and broad, with the pubescence normal; marginal and radial veins normal; postmarginal vein often wanting; mesonotum with complete or incomplete furrows......................Family LXXI. EULOPHIDÆ.

Tarsi 3 jointed; anterior wings short and broad, broadly rounded at apex with the pubescences most frequently arranged in rows, more rarely normally pubescent; marginal and radial veins united in the form of a strongly curved line ∩..........Family LXXII. TRICHOGRAMMIDÆ.

12. Pronotum usually large, rounded, or conically produced anteriorly; wings always with a long marginal fringe, nearly veinless and always without a radius (stigmal vein), the marginal vein most frequently reduced to a mere dot; antennæ in female most frequently terminating in a distinct fusiform or egg-shaped solid club, more rarely with a 2-jointed club; tarsi 4–5 jointed .....Family LXXIII. MYMARIDÆ.

Superfamily VIII. ICHNEUMONOIDEA.

TABLE OF FAMILIES (see p. 5).

Family LXXIV. EVANIIDÆ.
Family LXXV. AGRIOTYPIDÆ.
Family LXXVI. ICHNEUMONIDÆ.
Family LXXVII. ALYSIIDÆ.
Family LXXVIII. BRACONIDÆ.
Family LXXIX. STEPHANIDÆ.

Suborder II. PHYTOPHAGA.

Superfamily IX. SIRICOIDEA.

TABLE OF FAMILIES.

Metathorax fissured in the middle at apex.................................. 2

Metathorax not fissured.

Vertex tuberculate; antennæ inserted below the clypeus and eyes; front wings with two submarginal cells; abdomen cylindrical or depressed; ovipositor not exserted....................Family LXXX. ORYSSIDÆ.

2. Middle lobe of mesonotum attaining the scutellum and separated from it by a transverse line; abdomen cylindrical or depressed.

Prothorax large, subquadrate; costal cell of front wings not divided by a transverse nervure; tip of abdomen ending in a triangular or lanceolate process..........................Family LXXXI. SIRICIDÆ.

Prothorax conical; costal cell of front wings divided by a transverse nervure; abdomen at tip normal ....Family LXXXII. XIPHYDRIIDÆ.

Middle lobe of mesonotum not attaining the scutellum; abdomen more or less compressed.......................Family LXXXIII. CEPHIDÆ.

Superfamily X. TENTHREDINOIDEA.

TABLE OF FAMILIES.

Prothorax emarginate behind; middle lobe of mesonotum much longer than broad, not separated from the scutellum by a deep fovea; costal vein usually strongly thickened or clavate toward apex; costal cell *without* an intercostal vein; scape of antennæ very short or globose. 2

Prothorax subtruncate behind; middle lobe of mesonotum not much longer than broad, and separated from the scutellum by a deep fovea; costal nervure toward apex neither thickened nor clavate, the cubitus originating from the basal nervure; costal cell usually *with* an intercostal vein, rarely without (*Megalodontinæ*); scape of antennæ long or rather long.

Head transverse, the temples not very broad; third joint of antennæ very long, three or four times longer than the long scape; abdomen subdepressed, the ovipositor more or less exserted.
Family LXXXIV. Xyelidæ.

Head quadrate, the temples very broad, third joint of antennæ rarely much longer than the scape; abdomen much depressed, the ovipositor hidden .... Family LXXXV. Lydidæ.

2. Basal nervure in front wings usually uniting with the subcostal vein far from the origin of the cubitus; basal plates of first abdominal segment usually closely united, rarely showing a slight median emargination at apex; if deeply emarginate, the sides of the abdomen acutely margined, while the antennæ are clavate 7

Basal nervure in front wings usually uniting with the base of the cubitus or with the subcostal very near its base; basal plates of first abdominal segment most frequently not united, medially slit or with a wedge-shaped or broadly triangular emargination, sides of abdomen rounded, never acutely margined.

Front wings with two cubital cells 6

Front wings with one cubital cell 3

3. Front wings without a lanceolate cell 5

Front wings with a lanceolate cell.

Antennæ 9 to 25 jointed 4

Antennæ 3-jointed.

Hind wings with an anal cell; tibiæ usually with lateral spurs; antennæ in female with the third joint very long, subclavate or filiform, densely hairy, in male most frequently forked.
Family LXXXVI. Hylotomidæ.

4. Hind wings with an anal cell; female antennæ usually serrate or subserrate, male antennæ ramose or biramose ..... Family LXXXVII. Lophyridæ.

Hind wings without an anal cell; female antennæ most frequently subclavate or filiform, male antennæ usually ramose or filiform.
Family LXXXVIII. Perreyiidæ.

5. Hind wings without an anal cell; antennæ 6 to 25 jointed, in female clavate or subclavate, more rarely filiform, in male ramose or simple, filiform, multiarticulate .... Family LXXXIX. Pterygophoridæ.

6. Body rather short, oviform, the abdomen not long; scape small, scarcely longer than thick, not or only a little larger than the pedicel (except in the *Blasticotominæ*, which has, however, only 4-jointed antennæ); antennæ 4 to 15 jointed; head, seen from above, not quadrate, the occiput more deeply concave, the temples not so broad, more rounded behind, while there is no distinct furrow or depression between the antennæ and eyes, or so slight as to be scarcely noticeable .... Family XC. Selandriidæ.

Body elongate, the abdomen usually long, narrow, and subcylindrical; scape rather large, usually thrice as long as thick, or about four times larger than the pedicel; antennæ 9-jointed; head, seen from above, quadrate, the temples very broad and with a furrow, channel, or

depression on each side of the antennæ, between them and the eyes, which extends upward and posteriorly on the vertex.
Family XCIII. TENTHREDINIDÆ (part)
(=Subfamily STRONGYLOGASTERINÆ).

7. Front wings with two cubital cells 8
Front wings with one cubital cell; second submarginal cell receiving two recurrent nervures; lanceolate cell contracted near the middle and closed at base, or petiolate; antennæ 9-jointed...Family XCI. NEMATIDÆ.

8. Abdomen acutely margined at sides; antennæ clavate, 5 to 8 jointed 9
Abdomen not margined at sides; antennæ not clavate, 8 to 9 jointed; front wings with three or four cubital cells.

Front wings with four cubital cells, the second usually receiving both recurrent nervures or the second recurrent is interstitial with the second transverse cubitus, very rarely joining the base of the third submarginal cell; if with only three cubital cells the first transverse cubitus is wanting; abdomen short, oviform.
Family XCII. DINEURIDÆ.

Front wings with four cubital cells, the second and third each receiving a recurrent nervure; if with three submarginal cells, either the first or the second transverse cubitus is wanting; abdomen elongate, subcylindrical....................Family XCIII. TENTHREDINIDÆ.

9. Dorsal plates of first abdominal segment usually deeply emarginate medially, leaving a membrane exposed...........Family XCIV. CIMBICIDÆ.

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A NEW RHINOCEROS, TRIGONIAS OSBORNI, FROM THE MIOCENE OF SOUTH DAKOTA.

By **Frederic A. Lucas**,
Curator, Division of Comparative Anatomy.

The name *Trigonias osborni* is proposed for a rhinoceros from the Miocene, presumably the Lower Titanotherium beds of South Dakota, represented by the anterior part of the palatal portion of the cranium bearing on the right side three incisors, a canine, and the first three premolars, and on the left side the third incisor and first three premolars.

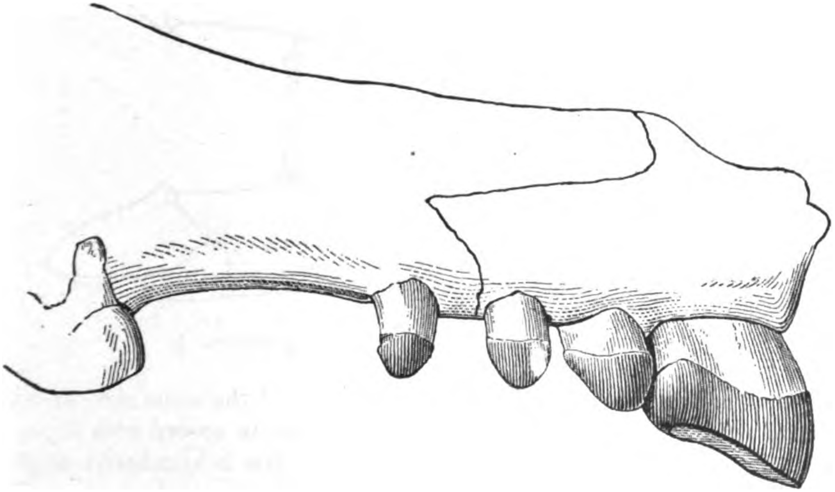

FIG. 1.—ANTERIOR PORTION OF CRANIUM OF TRIGONIAS OSBORNI. $\frac{1}{1}$

The generic name is given in reference to the triangular shape of the cutting portion of the procumbent tooth, while the species is named in honor of Henry F. Osborn, who has done so much toward increasing our knowledge of the extinct rhinoceroses. The specimen bears the number 3924, catalogue of fossil vertebrates, U. S. National Museum. The species is remarkable from the fact that it possesses three incisors and a canine, having therefore the most generalized dentition of any rhinoceros thus far discovered. The canine and second and third incisors are of the same general shape, being slightly compressed with rounded points; the canine is the smallest tooth in the series and the teeth progressively increase in size from the canines forward. The three premolars are practically of the same size, as those shown on Plate XIII, fig. 7, of Osborn's memoir on the Extinct Rhinoceroses, but exhibit a greater degree of wear. The first premolar is, however, slightly more elongate and less trihedral in section than the first premolar there shown, while the protoloph is narrower, lies on the extreme inner edge of the tooth, and runs directly backward.

The left ramus of a jaw, including the entire symphysial portion, also from the Miocene of South Dakota, is assigned to this species, as the two specimens are from animals evidently of the same size, and the peculiarities of dentition shown by the jaw are in accord with those of the portion of cranium just described. The jaw is numbered 4815 in the catalogue of fossil vertebrates, U. S. National Museum. The important portion of the jaw is the symphysis, which bears on either side a small inner incisor, the root of which only is present, a large procumbent tooth, usually regarded as a canine, and back of this an alveolus for a third and small tooth. The presence of this tooth shows conclusively that, whether it be regarded as a canine or an incisor, the large procumbent tooth must be an incisor. Until proof to the contrary is forthcoming, I prefer to look upon the small tooth as the third incisor and to regard the canine as absent.

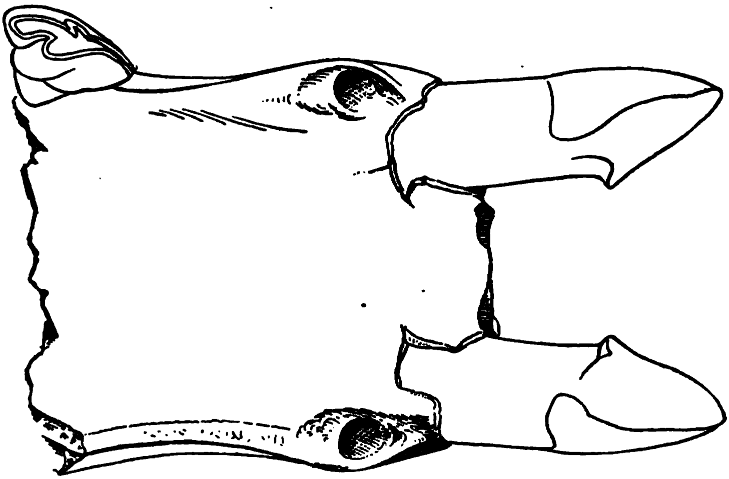

FIG. 2.—SYMPHYSIS OF JAW OF TRIGONIAS OSBORNI. ½

The lower grinders increase considerably in size from before backward, so that while the second and third premolars are of nearly the same size as those of a specimen of *Aceratherium occidentale* used for comparison the molars are very much larger.

Measurements.—Upper jaw: length of largest incisor at widest part, 24 mm.; length from anterior part of first incisor to back of canine, 56 mm.; length of diastema, 29 mm.; and length of three premolars, 70 mm.

Lower jaw: length of symphysis, 82 mm.; length of diastema, 35 mm.; length of premolar series, 90 mm.; length of molar series, 115 mm.; length from anterior part of symphysis to posterior angle in a straight line, 410 mm.

NEW SPECIES OF MOTHS OF THE SUPERFAMILY TINEINA FROM FLORIDA.

By August Busck,

U. S. Department of Agriculture.

I am indebted to Dr. Harrison G. Dyar for placing in my hands for rearing and determination his interesting collections of Tineina from Palm Beach, Florida, secured during January, February, and March, 1900.

Nearly all were taken in the larval state and reared by him or by the writer, or by us both.

The food plants were determined by Mr. F. Kinzel, of Palm Beach.

The following species, I believe, are new to science. All the types have been deposited in the U. S. National Museun.

Family GELECHIIDÆ.

ARISTOTELIA Hübner.

ARISTOTELIA IVÆ, new species.

(Plate I, fig. 1.)

Antennæ ¾,[1] finely serrated, dark fuscous, annulated with white. Labial palpi very long, curved, second joint thickened with appressed scales, yellow with three black bars on outside; apical joint longer than second, acute, yellow with two black bars. Face, head, and thorax light brownish gray with a dark fuscous, central, longitudinal line on head and thorax; tegulæ dark brown. Forewings with the markings of *A. roseosuffusella* Clemens, but with different coloration. Ground color light silvery drab, on the outer half freely dusted with white and black scales; from costa two dark brown, nearly black, bands reaching the fold; the first from base of costa obliquely outward, narrowing to a point; the other from basal third curves outward and upward to a point after having reached the fold. These spots are narrowly margined with silvery yellow. A third indistinct, triangular, costal, light-brown spot has this margination wider and is followed by a small whitish spot. Tip of wing black; cilia drab with a bunch of dark hairs in the middle. Hind-wings under 1, trapezoidal, apex produced, termen emarginate, dark gray, cilia silvery yellow. Legs yellow, on the outside barred with black.

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[1] This abbreviation, with others here used, is adopted from Meyrick's Handbook of British Lepidoptera (1895), London and New York.

Venation.—Fore-wings: 12 veins, 7 and 8 stalked, 6 separate.[1] Hind-wings: 8 veins, all separate.

Alar expansion, 11.2 to 11.8 mm.

Very near *A. roseosuffusella* Clemens, but larger and without any trace of red coloration.

Described from 6 females, reared from *Iva frutescens*, collected by Dr. Dyar at Palm Beach, Florida.

Type.—No. 4932, U.S.N.M.

The larva when full grown is about 12 mm. long, very active, slender, dark purple, with 8 white wavy, interrupted, longitudinal lines; underside dark green; head yellow, with black eye-spots; it feeds in a slight web among the leaves. Moth issued March 10–20.

APROAEREMA Durrant=ANACAMPSIS (Curtis) Meyrick.

APROAEREMA CROTOLARIELLA, new species.

(Plate I, fig. 2.)

Antennæ ⅘, slightly serrated, bluish black, with a thin, white, longitudinal line on basal third. Labial palpi long, slender, smooth, curved; second joint somewhat thickened, third joint a little longer than second, pointed; bluish black; second joint with apex white, third with three thin, white, longitudinal lines. Tongue moderate, scaled. Head, face, and thorax uniformly bluish black. Fore-wings bluish black, with sparse lighter blue metallic scales intermixed, especially toward apex; cilia dark gray. Hind-wings gray, with purple reflections, cilia 2. Abdomen black, with purple reflections; legs bluish black, with tarsi annulated with white.

Venation.—Fore-wings: 12 veins, 7 and 8 stalked, 6 out of 7. Hind-wings: 8 veins, 2 and 3 connate, 5 approximate to 4, 6 and 7 long stalked; apex produced, termen sinuate.

Alar expansion 8.2 to 8.8 mm.

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[1] Lord Walsingham, in his West Indian Microlepdoptera (Proc. Zool. Soc., London, Jan., 1897, p. 66), has placed *A. roseosuffusella* Clemens and *A. pudibundella* Zeller in a division of *Aristotelia*, as he defines this genus, which has vein 6 out of vein 7 in forewing. This is a mistake, vein 6 being separate; both species, as well as the present species, *A. ivæ* Busck, belong to Aristotelia proper in the restricted sense in which Dr. Edward Meyrick uses it in Handbook of British Lepidoptera, 1895.

Described from 16 specimens, bred February 18 to March 10, from *Crotolaria pumila*, collected by Dr. Dyar at Palm Beach, Florida.

Type.—No. 4933, U.S.N.M.

The larva, which in early stage mines and later ties the leaves together, is prettily marked; when full grown it is about 6 mm. long, cylindrical, yellowish white, with head concolorous; thoracic shield yellow with two dark-brown lateral spots; each of the following segments with two indistinct reddish dorsal spots and two very distinct darker reddish-brown lateral spots, forming altogether four longitudinal rows of spots. Pupation takes place in a slight web among the leaves.

GNORIMOSCHEMA new genus.

(Type, *Gelechia gallæsolidaginis* Riley.)

Antennæ simple. Labial palpi; second joint large with a well-developed furrowed brush beneath; terminal joint shorter than second, more or less thickened with scales, laterally compressed, front sharp, sometimes slightly serrate, with thin scale projection above the tip. Maxillary palpi obsolete. Tongue moderate, scaled at base.

Anterior wings narrow, elongate, somewhat sinuate below apex, which is bent slightly downward.

Posterior wings a little broader than anterior wings; costa deflected downward from the middle of the wing; apex produced, termen sinuate, tornus rounded, dorsal edge straight.

Venation.—Forewings: 12 veins, 7 and 8 stalked, the rest separate. Hindwings: 8 veins, 3 and 4 connate, 5 approximate to 4, 6 and 7 parallel.

The parallel veins 6 and 7 in hind wing and the thickened third joint of labial palpi separates this genus, to which several described American species belong, from Gelechia, from which it is derived.

I make *gallæsolidaginis* Riley the type because it is the largest and best-known species at present described.

GNORIMOSCHEMA TERRACOTTELLA new species.

(Plate I, fig. 3.)

Antennæ ¾, finely serrated, black, with white annulations. Labial palpi white; second joint with divided brush beneath; third shorter than second, with one black annulation just before apex. Face, head and thorax white, shoulders reddish brown. Forewings reddish brown; costa white, with two lobes of white reaching down to fold, the first narrow, pointed obliquely outward, the other large, triangular. At beginning of cilia is a costal white spot and opposite it a dorsal one. On the fold beyond the middle is a small white dot. The interval between the white lobes and spots, as well as the apical part of wing, is freely dusted with black and purple scales. Cilia yellow, dusted with black. Hindwings purplish gray, cilia with yellowish tinge. Abdomen white with rust-red shadings; underside and legs white; tarsi with black annulations.

Venation.—Forewings: 12 veins, 7 and 8 stalked. Hindwings: termen sinuate, apex produced, 8 veins, 3 and 4 connate, 6 and 7 parallel.

Alar expanse, 10 mm.

Described from 4 specimens, issued March 8 to 10, from *Iva imbricata*, collected by Dr. Dyar at Palm Beach, Florida.

Type.—No. 4934, U.S.N.M.

The larva mines the thick, fleshy leaves, eating out irregular tracks or blotches, and pupates outside the mine (in nature probably in rubbish on the ground) in a slight web. Larva is slender, cylindrical, white with dark-brown head and light-brown thoracic plate. Length, when full grown, about 10 mm.

NEALYDA Dietz.

Nealyda DIETZ, Entomol. News, Phila., XI, 1900, pp. 350, 351.

Dr. Dietz erected this genus on a single species, *bifidella* Dietz, collected in Colorado, an authentic specimen of which is before me. He places it in the Elachistidæ, near Scythris, but it belongs undoubtedly in the Gelechiidæ.

There are a few misconceptions in his characterization of the genus. The posterior tibiæ are hairy, not smooth, and Dr. Dietz's explanation of the venation of the hindwing is in variance with his figure and not quite correct. I would give it thus: Six veins, 5 and 6 absent, cell open between 4 and 7, 7 to apex, 2 and 3 remote out of 4. What Dr. Dietz takes to be veins 5 and 6 are not true veins, but folds, and it is not the costal, but the subcostal, (vein 7) which reaches nearly to the extreme apex.

The genus is nearest Didactylota Walsingham (Plate 1, fig. 4), and belongs to that group of Gelechiids in which the median vein system of the hindwing is strongly developed at the expense of the middle part of the wing.[1] I suspect that Walsingham's *Didactylota bicolor*[2] from St. Vincent will be found to belong to this genus.

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[1] As will be seen by comparing the venation of *Didactylota snellenella* Walsingham with that of the *D. kinkerella* Snellen type of the genus (Tijdschrift voor Entomology, 1876, pl. 1), it is really quite different from this and might well be separated generically. The long, very different labial palpi of *snellenella* also shows that it only temporarily has found a place in that north European genus. In fact, Nealyda seems nearer the type of Didactylota than *snellenella*, but still I think the former genus is well founded.

[2] Proc. Zool. Soc. London, 1891, p. 523.

NEALYDA PISONIÆ, new species.

(Plate I, fig. 5.)

Antennæ nearly ⅔, simple, brown with black annulations. Labial palpi second joint fuscous, white at apex, terminal joint black with a white annulation around middle. Maxillary palpi obsolete. Face, head and thorax bright golden brown. Anterior wing very thickly scaled; ground color concolorous with thorax, bright golden brown; one-third from base is a dark, rich, velvety brown, broad fascia, sharply defined on both sides, darkest, nearly black, and somewhat broader at the dorsal edge, where it terminates in slightly raised scales, projecting outside the edge of wing in a dorsal tooth, and forming in the living insect at rest a curious hump on the back. This fascia is still more thickly scaled than the rest of wing. A little more than the apical third of wing is densely dusted with black scales, which condense into four, all black, velvety spots, one large costal spot, one-third from apex reaching down to fold, one smaller apical, one moon-shaped at tornus, and a small round dot between the two latter. The last three are internally edged by light silvery scales forming an indistinct, thin, open V, with the point toward apex. Cilia very heavy and cut off nearly perpendicular, giving the wing the appearance of being very broad. This, together with the robust body, gives the moth a certain resemblance to a Tortricid. Hindwings bilobed, three-fifths as wide as forewings, purplish grey with silvery reflections; cilia lighter. Abdomen dark purple with metallic reflections. Legs and underside of thorax straw-yellow with sparse purple scales intermixed; tarsi black with yellow annulations. Posterior tibiæ with long yellow hairs above.

Alar expanse: male, 7 mm.; female, 8.2 mm.

Described from 2 specimens, reared February 2 and February 18, 1900, from mines on *Pisonia aculeata*, collected by Dr. Dyar at Palm Beach, Florida.

Type.—No. 4935, U.S.N.M.

Egg is laid at the midrib on the upper side of the leaf and the mine is a more or less irregular, large, trumpet-formed blotch on the upper surface with the black frass scattered in the middle of the mine. The larva is, when full grown, cylindrical, somewhat flattened, strongly segmented, and tapering backward, about 7 mm. long. It has three pairs of normal thoracic feet, four pairs of abdominal feet suggesting the toes of a tree frog, being very long and thin with a globular swelling at the end; while in the mine they are pointed backward, flat to the body; no anal legs. Larva is white with light-brown head and thoracic plate; sutures in head darker brown. When mature it cuts its way out of the mine and spins nearby on the leaf a tough, oval, flat, white cocoon, from which the pupa does not protrude, when imago issues. Some of the larvæ spun their cocoons inside the mine, but this is probably not the rule under natural conditions. Pupa stage lasted in warm room (approximately normal temperature for the insect) about eighteen days.

NEALYDA KINZELELLA, new species.

Antennæ ¾, finely serrate, dark fuscous with indistinct whitish annulations. Labial palpi yellowish brown with black shadings beneath. Face and head light yellowish brown. Thorax light rich brown; basal half of forewing light brown, the color gradually becoming darker outwardly and terminating in a deep velvety brown, transverse fascia at middle of wing, on the outside edged with a thin line of white scales. The fascia is more thickly scaled than the rest of the wing and protrudes in a small dorsal scale tooth. Ground color of apical half of wing silvery white, thickly suffused with black, fuscous and bluish scales. An ill-defined group of dark scales at beginning of cilia is edged below with a few brown scales; another at apex also has a few brown scales below; at tornus a nearly black spot. Entire apical edge nearly black; cilia silvery grey overlaid with black atoms. Hindwings silvery grey. Abdomen purplish black; underside silvery; legs light brown with black bars on the outside, tarsi with black annulations.

Alar expanse, 5.5 to 6.5 mm.

Described from 5 specimens, reared from upper surface, trumpet-formed blotch mines on leaves of *Pisonia obtusata.*

Collected by Dr. Dyar at Palm Beach, Florida.

Type.—No. 4936, U.S.N.M.

This species is very near to the type of the genus, *bifidella* Dietz, but besides minor colorational differences it is a much smaller insect.

Egg is laid on upper side of leaf. Larva, when full grown, is 4.5 mm. long; looks through the leaf like a Lithocolletis larva of the flat type. Also the mine might be mistaken for a Lithocolletis mine. Cocoon outside mine on leaf snow white, oval, flat, very densely spun. Pupa not protruding when imago issues.

I have named this species in honor of the botanist, Mr. F. Kinzel, to whom I am indebted for all but one of the plant identifications.

ANACAMPSIS Curtis = TACHYTILIA (Heinemann) Meyrick.

ANACAMPSIS LAGUNCULARIELLA, new species.

(Plate I, fig. 6.)

Antennæ light brown with darker annulations. Labial palpi very long, smooth, recurved; second joint thickened with appressed scales, deep black, apex light brown; third longer than second, yellowish brown. Tongue moderate, scaled, black. Face, head, thorax, and forewings yellowish brown with sparse, scattered, black scales. Extreme base of costa black; at middle of wing a triangular black costal spot, sometimes followed by a smaller indistinct collection of black scales at costa at apical third. Sometimes this latter is wanting; intervals between veins depressed, and in these depressions, one in each, is a row of 4 to 6 small black dots around apex. Cilia ashy brown, with two indistinct, darker, transverse lines. Hindwings dark purplish grey. Cilia lighter. Abdomen and legs purplish black with a yellowish sheen; hairs on posterior tibia yellow; tarsi with narrow yellow annulations.

Alar expanse, 15 to 16 mm.

Described from 10 specimens, reared by Dr. Dyar at Palm Beach, Florida, from *Laguncularia racemosa*, on which it ties the leaves.

Type.—No. 4937, U.S.N.M.

Larva slender; when full grown about 13 mm. long; white, with dark-brown head, lighter mandibles, reddish first thoracic segment and black thoracic plate. Warts small, black, emitting long white hairs.

ANACAMPSIS ARGYROTHAMNIELLA, new species.

Antennæ stone white with narrow black annulations. Labial palpi very long, smooth, recurved. Second joint thickened with appressed scales, stone white; third longer than second, light fuscous. Face and head stone white. Thorax and forewing stone grey with scattered black atoms. Three white dots on disk, one at middle of wing below the fold, two above the fold farther outward. Just before apex an ill-defined, but quite distinct, outwardly angulated, white fascia. Cilia yellowish-grey. Abdomen grey, with silvery luster. Anal tuft yellow. Legs yellowish-grey. Forelegs with fuscous shadings and tarsi indistinctly annulated.

Alar expanse, 16 mm.

Described from 6 specimens, reared by Dr. Dyar at Palm Beach, Florida, from *Argyrothamnia blodgettii.*

Type.—No. 4938, U.S.N.M.

Larva is a leaf tier; when full grown about 14 mm. long, greenish white with the ten piliferous warts on each segment shining black, emitting short dark hairs. Head and thoracic plate polished black, mandibles reddish brown.

TRICHOTAPHE Clemens.

TRICHOTAPHE MELANTHERELLA, new species.

(Plate I, fig. 7.)

Antennæ purplish brown. Labial palpi long, smooth, curved. Second joint thickened with appressed scales, third as long as second; shining dark purplish brown, extreme tip yellow. Face, head, and forewing unicolorous, deep purplish brown, nearly black, with a satin luster. Before middle of wing, near dorsal margin, is a short black streak, edged anteriorly and posteriorly with a few white scales. At the end of the cell is a small round black dot, slightly edged posteriorly with white; a scarcely perceptible, outwardly angulated, narrow fascia of a paler shade at apical fourth terminates in a yellowish costal streak. Cilia dark purple. Hindwing dark purplish gray; cilia a shade lighter.

Venation.—Forewing: 12 veins; 2 and 3 stalked, 7 and 8 stalked. Hindwing: 8 veins, 3 and 4 short-stalked, 5 approximate, 6 and 7 connate, discal vein nearly obsolete.

Abdomen purplish black, anal tuft yellow; legs silvery fuscous.

Alar expanse, 12.5 to 13 mm.

Described from 11 specimens from material collected by Dr. Dyar at Palm Beach, Florida. Food plant *Melanthera deltoidea.*

Type.—No. 4939, U.S.N.M.

It is near *T. juncidella* Clemens.

Larva when full grown is about 12 mm. long, very prettily marked. Front of head light brown, posteriorly black. Next 5 joints rich brown, thoracic shield lighter brown, edged with black. First and second abdominal segments (the last two brown ones) with large transverse dorsal velvety black spot. Remaining segments green; segments 7 and 8 (head counted as the first) with black semicircular line across pointing backward and reaching down to abdominal legs; also a short transverse black dorsal line behind the curved one; segment 9 all black above; rest of segments with the black predominating in streaks and dots. All legs black. It lives within a roomy fold made of edge of leaf turned down or sometimes of an entire leaf of above plant.

Imago issued during early March.

TRICHOTAPHE CONDALIAVORELLA, new species.

Antennæ ¾ finely serrate, shining bronze. Labial palpi second joint smooth, flattened laterally, considerably thickened toward apex with hairs above and below and cut off sharply at end—approaching the palpi of Ypsolophus; third joint erect. Second joint deep black with apex light yellow, third joint fuscous. Face, head, thorax and basal half of costal edge of forewing brown. Forewing greenish gray, thickly suffused with dark fuscous scales. Five indistinct dark fuscous spots on disk, one on fold at one-fourth from base, one above and one below fold in middle of disk and one above and one below fold at end of disk; the latter smallest, but darker and more distinct. At beginning of costal cilia a very indistinct, double, transverse, whitish V-shaped line and along apical edge 6 or 7 small black dots. Hindwing dark bluish gray with silvery reflections, half transparent, veins darker, cilia gray.

Abdomen purple; entire under side black; legs black; posterior tibiæ above yellowish.

Venation.—Forewing: 12 veins; 2 and 3 stalked. Hindwing: 8 veins, 3 and 4 short-stalked; 5 approximate, 6 and 7 connate.

Alar expanse, 16 mm.

Described from two males and one female reared from *Condalia ferrea*, collected by Dr. Dyar at Palm Beach, Florida.

Type.—No. 4940, U.S.N.M.

Dr. Dyar says:

> The larva at first stitches together any overlapping leaves of its food plant; later it folds over a leaf, and finally pupates in such a folded leaf. The mature larva has a reddish head with a whitish labrum; body somewhat flattened, green, with reddish cervical shield, a green dorsal and subdorsal line; tubercles and a lateral dash on joints 3 and 4 black.

Family ŒCOPHORIDÆ.

DEPRESSARIA Haworth.

DEPRESSARIA AMYRISELLA, new species.

(Plate I, fig. 8.)

Antennæ ¾ finely serrate beneath, basal joint with pecten, dark metallic greenish brown. Labial palpi second joint rough beneath, yellowish white with black base and black scales intermixed, toward apex with a rose or brick red tinge; terminal joint shorter, yellowish with black tip. Tongue well developed, whitish. Face yellow with a few brown scales; head with erect scales, yellow at base, purplish black toward tip, tips reddish white. Thorax yellowish brown with violaceous scales intermixed and with a transverse crest of six tufts of raised scales. Forewing dark violaceous brown with sparse black scales; extreme dorsal base purplish black, at basal third a collection of purplish-black scales; at end of cell a small round white dot, black-margined on both sides. Costal and apical edge lighter brown, with five costal and six to eight smaller apical black dots. Cilia yellowish brown. Hindwing light shining yellowish brown, edge blackish, cilia lighter. It belongs to the section with veins 2 and 3 in forewing stalked. Abdomen somewhat flattened, dark yellowish brown. Legs light yellowish brown on the outside with purple scales intermixed.

Alar expanse, 16 to 17 mm.

Described from 5 specimens, reared by Dr. Dyar at Palm Beach, Florida, from *Amyris floridana*.

Type.—No. 4941, U.S.N.M.

According to Dr. Dyar "the larva lives in a folded young leaf with a round hole at petiole, lined with silk." Head black, body yellowish, cervical shield pale orange color. It pupates within the fold.

Family BLASTOBASIDÆ.

BLASTOBASIS Zeller.

(Type, *Œcophora* (*Scythris*) *phycidella* Zeller.)

BLASTOBASIS GUILANDINÆ, new species.

(Plate I, fig. 9.)

Antennæ dark fuscous, basal joints yellowish; in the male strongly notched beyond first joint, with pecten on this joint; shortly ciliated in its entire length; in female simple, basal joint with pecten. Labial palpi smooth, curved, slender, dark fuscous; tips somewhat lighter. Tongue stout, scaled at base, coiled at the end. Head and thorax yellowish fuscous; forewing dark fuscous with a somewhat lighter shade before apex and along costa. A small deep black spot on middle of cell; two similar black spots at end of cell, one above the other; below these an indistinct blackish spot and similar indistinct blackish spots along the apical edge. Cilia yellowish fuscous. Hindwing shining yellowish fuscous.

Abdomen shining dark fuscous; anal tuft yellow; underside whitish, speckled with dark fuscous. Legs yellowish with fuscous shadings on the outside; hairs above posterior tibiæ ashy yellow.

Venation.—Forewing: 12 veins; 7 and 8 stalked. Hindwing: 7 veins; 4 absent, 3 and 5 stalked, 6 and 7 parallel.

Alar expanse, 14 mm.

Described from 1 male and 1 female bred March 30, 1900, from stems of *Guilandina bonducella*, collected by Dr. Dyar at Palm Beach, Florida, March 5, 1900.

Type.—No. 4942, U.S.N.M.

Larva is robust, white, with brown head and thoracic plate. It bores in the stem and pupates outside in a slight web.

There are two other species of true *Blastobasis* in the collected material from Palm Beach, but not in sufficiently good condition to describe.

Family ELACHISTIDÆ.

COSMOPTERYX Hübner.

COSMOPTERYX IPOMOEÆ, new species.

Antennæ dark greenish brown with a thin, white, longitudinal line on basal half; the three last joints are white, the five following black, and the next joint (ninth from apex) is white. Labial palpi, shining greenish black. Head and thorax dark greenish brown, nearly black, with one very faint central line white. Forewing unicolorous with head and thorax. Beyond the middle is a broad, pale straw yellow fascia, slanting from costa outwards. This is preceded by two bright-golden metallic spots, the costal one dark margined, and, on account of the form of the fascia, nearer the base of wing than the dorsal one. On the other side of the fascia is another dark-edged golden costal spot, and right opposite, in the yellow fascia, a dorsal one; between these the yellow fascia flows out in a bilobed process into the dark apical part of the wing.

In the basal half of the wing are three very faint, thin, white longitudinal lines, all more or less interrupted, the central one being the most distinct, and this is continued on the other side of the fascia to apex as a more pronounced white streak. Cilia dark brown. Hindwing dark brown, with green reflections; cilia lighter. Abdomen purplish black above, each segment edged with silver; anal tuft silvery; underside silvery white.

Posterior tibia black, with a longitudinal, winding, white line; tarsi black with white tips.

Alar expanse, 8 mm.

Described from two specimens reared from Ipomœa leaves, collected by Dr. Dyar at Palm Beach, Florida.

Type.—No. 4943, U.S.N.M.

The mines were found numerously, together with *Bedellia minor* Busck (see p. 243), and is somewhat similar to these in appearance, consisting of clear, irregular blotches; but is distinguished from them by short silk-lined galleries inside the mine, in which the larva retreats when disturbed.

Larva is, when young, white with yellow head and dark eyespots and mandibles; when mature it measures about 7 mm., and has three wine-red longitudinal stripes, one dorsal and two lateral, all rather narrow.

It pupates in an inconspicuous, matted, flat cocoon outside the mine.

COSMOPTERYX NIGRAPUNCTELLA, new species.

Antennæ drab colored, basal half with a thin longitudinal white line, lighter, nearly white, toward tip. The last joint is black, and there are four small (two joints in each) black annulations on apical half. Labial palpi very long, light drab colored, with extreme tips black. Face whitish drab. Head drab, with a central, longitudinal, silvery line; thorax same color with three longitudinal, silvery lines. Forewing very long and slender, twice as long as abdomen; basal half concolorous with head and thorax, with three longitudinal, white lines, of which only the upper two begin right from base. The rest of the wing creamy white with a deep black, silver-edged dot at the end of cell; a narrow costal and dorsal streak of drab form a thin fascia at apical fourth, and the costal edge of the tip is drab. Cilia light drab. Abdomen golden, legs silvery drab.

Alar expanse, 11 mm.

A large and slender, very distinct species, described from a single captured male specimen, collected by Dr. Dyar at Palm Beach, Florida, in January, 1900.

Type.—No. 4944, U.S.N.M.

ANTISPILA Hübner.

ANTISPILA EUGENIELLA, new species.

Antennæ purplish black. Palpi, face, head, thorax and forewing shining dark purple; on middle of forewing a golden metallic fascia, narrow at the dorsal edge, three times as wide at costa. Cilia purplish black. Hindwing dark gray with metallic reflections; abdomen dark purple below, with silvery edging at each joint; legs dark purple outside, inside silvery. Tarsi silvery with purple annulations.

Alar expanse, 3.8 mm.

Described from a single specimen, bred February 25, 1900, from Eugenia sp., collected by Dr. Dyar at Palm Beach, Florida.

Type.—No. 4945, U.S.N.M.

Larva makes an upper blotch mine on leaves of Eugenia, and cuts out an oval case (3.5 by 2.8 mm.), which falls to the ground.

HOMALEDRA, new genus.

(Type, *Homaledra heptathalama* Busck.)

Antennæ longer than forewing, stout, smooth, simple, scaled at base; basal joint enlarged, somewhat flattened, and with thick covering of scales, projecting backward. At rest they are kept alongside the body under the wings. Labial palpi with second joint very long, nearly straight, porrected, smooth, thin at base, greatly thickened at apex, ending abruptly with projecting scales; terminal joint short, erect, smooth. Tongue scaled at base. Head elongated, face retreating. Anterior wings elongate ovate. Hindwing elongate ovate; cilia 2. Legs short; posterior tibiæ clothed with long hairs above.

Venation.—Forewings: Twelve veins; 7 and 8 connate or stalked, 7 to apex, 1c furcate. Hindwings: Eight veins; 8 separate, 7 separate, 5 and 6 stalked on independent vein from base, cell open between 4 and 5.

HOMALEDRA HEPTATHALAMA new species.

(Plate I, fig. 10.)

Antennæ silvery yellow; basal joint and the scaled base rust red. Labial palpi, second joint light straw colored, terminal rust red. Eyes deep black. Face whitish with an iridescent hue. Head and thorax straw yellow, sides of head and shoulders rust red. Anterior wings light straw yellow with a narrow edging round the entire wing of dark brown, outside which the extreme costal and apical edge and cilia is rust red. On middle of wings a longitudinal, large, comma-shaped, silvery spot, and at the end of the disk a smaller, nearly circular silver spot, both dark edged. There are, besides, three more or less pronounced longitudinal streaks of dark brown, one above and two below the silvery spots, and in some specimens even the veins are shown in brown; but in other specimens all these interior brown streaks are obsolete, except right at the base of the wing.

Dorsal cilia reddish yellow. Hindwings shining golden yellow; cilia a shade lighter. Abdomen golden yellow. Forelegs deep black above; other legs whitish straw colored; hairs above posterior tibia rust yellow.

Alar expanse, 19 to 26 mm.

Described from 8 specimens bred from cabbage palmetto (*Sabal palmetto*) collected by Dr. Dyar and Mr. F. Kinzel at Palm Beach, Florida.

Type.—No. 4946, U.S.N.M.

The larva is, when full grown, 15 to 18 mm. long, cylindrical, with normally developed thoracic and abdominal feet. Color white, with polished head, reddish-brown mandibles and eye-spot, and rather long, sparse, white hairs.

It feeds on the underside of the palmetto leaf in a fold, making a very unique chambered abode of its frass (or of the chewed epidermis) (Plate I, fig. 11). It begins by making a small elongate chamber and adds, as it grows, successively larger, more or less rectangular, thick-walled, communicating rooms to its house, the entire length of which is 1½ to 2 inches, and which when finished contains 7 (or sometimes 8) chambers; hence the name of the insect.

It pupates inside its case, and the moth issues through a round hole in the last chamber. This is different from the other chambers, being rather loosely built. The other chambers are very firm, smoothly finished outside, dark brown. The pupa is brown, very slender, antennæ and wing-cases reaching only halfway down the abdomen. Pupa skin is not protruded at issue.

The moth at rest sits pressed flat to its support, second joint of labial palpi and sides and ends of wings closely applied to it.

The insect seems to be quite common where it is found, and one palm leaf may contain several cases.

The genus is given the character "7 and 8 in forewing connate or stalked," so as to include the common palmetto feeder (*Laverna*) *sabalella* Chambers, which naturally belongs here, and which has a similar, although not so specialized, habit as *heptathalama*. *Sabalella* has all the characters of the genus and differs only from the type in veins 7 and 8 being stalked, instead of connate. As it is a less specialized and a smaller insect the characters are less pronounced, and I therefore make the larger form the type of the genus.

Family TINEIDÆ.

NEPTICULA Zeller.

NEPTICULA CONDALIAFOLIELLA, new species.

Face and head tufted, reddish yellow, eyecaps shining white. Antennæ dark fuscous. Thorax and forewing deep black with purplish metallic reflections; just beyond the middle of wing is a transverse silvery white fascia, a little broader on the dorsal margin than on the costal. Cilia at apex white; dorsal cilia light purplish-gray concolorous with hindwing. Abdomen black above, silvery below; anal tuft silvery white. Legs reddish yellow.

Alar expanse, 3.1 mm.

Described from three specimens bred February 22, 1900, from upper mines on leaves of *Condalia ferrea*, collected by Dr. Dyar at Palm Beach, Florida.

Type.—No. 4947, U.S.N.M.

Egg is deposited on underside of leaf near edge, and the mine is a contorted serpentine with black frass in a continuous central line. Cocoon is chestnut brown, 1.6 by 1 mm.

Of the described American species it comes nearest *N. apicialbella* Chambers, the description of which very nearly agrees with this species. Chambers's measurement, $\frac{6}{32}$ inch, and his type specimen in U. S. National Museum, shows, however, that *apicialbella* is a larger species which has relatively broader wings and broader fascia.

NEPTICULA MYRICAFOLIELLA, new species.

Antennæ silvery fuscous, extreme tip white. Face and head tufted, light golden yellow. Eyecaps silvery white. Thorax and forewing deep bluish black with strong metallic reflections. At two-thirds from base is a transverse, silvery white fascia, a little broader on the dorsal than on the costal edge. Dorsal cilia at the fascia white; rest of cilia dark purplish gray. Hindwing light gray. Abdomen shining black above, silvery below. Legs purplish. All tarsi white.

Alar expanse, 2.8 mm.

Described from two specimens, bred from upper serpentine mines on *Myrica cerifera*, collected by Dr. Dyar at Palm Beach, Florida.

Type.—No. 4948, U.S.N.M.

LEUCOPTERA Hübner=CEMIOSTOMA Zeller.

LEUCOPTERA ERYTHRINELLA, new species.

Antennæ fuscous, nearly as long as forewing. Maxillary and labial palpi absent. Face, head, eyecaps and thorax shining pure white. Forewing shining white; from middle of dorsal margin outward and upward to fold an oblique streak of sparse, fuscous scales, opposite which is a small indistinct costal streak of the same hue, together forming a V with the point toward apex. Three indistinct fuscous streaks within costal cilia and a large patch of somewhat darker fuscous scales on the dorsal edge of the wing near apex. Cilia and hindwings pure white; legs white with yellowish tarsi.

Alar expanse, 5 to 5.2 mm.

Type.—No. 4949, U.S.N.M.

Described from five specimens, bred February 10 to 20, 1900, from material collected by Dr. Dyar, at Palm Beach, Florida.

Egg is laid on underside of leaves of *Erythrina herbacea*, and the mine begins on the upper side as a short serpentine track, but soon broadens out in a large irregular blotch, often obliterating the early part of the mine. Frass black, scattered. When full grown the larva is 4.5 to 5 mm. long, cylindrical, somewhat flattened, first and second thoracic segments enlarged, body tapering backward. Color white, with light-brown mandibles and two small black lateral spots on first thoracic segment.

Pupates in "hammock" outside the mine on leaf in a glistening white oblong cocoon spun under an equally showy white bridgework of longitudinal silken bands. One leaf often contains several mines.

LEUCOPTERA GUETTARDELLA, new species.

Antennæ yellowish silvery; eyecap shining silvery white. Palpi absent. Head and thorax white. Forewing shining white, from costal two-thirds to middle of dorsal margin an oblique, golden, narrow fascia, black margined externally; from same point on costa to tornus is another similar golden fascia, also black margined externally, together with the first forming a V turned upside down; parallel with the latter fascia is a green costal streak, a little farther out toward apex, and still nearer apex is a small golden spot. At extreme apex is a small circular black dot and at tornus around the base of the second golden fascia is an aggregation of black scales. Cilia golden white with a thin black line parallel with the dorsal edge.

Hindwings and cilia white. Abdomen sparsely scaled, yellowish, with the scales silvery. Legs silvery, anterior tibiæ and tarsi and posterior tarsi fuscous on the outside.

Alar expanse, 5 mm.

Described from a single specimen, reared from *Guettarda elliptica*, collected at Palm Beach, Florida, by Dr. Dyar.

Type.—No. 4950, U.S.N.M.

Larva first makes a crooked narrow mine with the black frass in a continuous central line. Then the mine broadens out in an underside blotch, visible about as much on upper side and usually confined between two veins, which makes it more or less quadrangular, often entirely obliterating the early part of the mine.

Larva, when mature, is about 3.5 mm. long, somewhat flattened. It leaves its mine through a slit on the underside and spins its snow-white cocoon in a small fold at the edge of the leaf, under but few longitudinal silken threads. The food plant was kindly determined by Mr. C. L. Pollard, of the U. S. National Museum.

PODIASA, new genus.

(Type, *Podiasa chiococcella*, Busck.)

Antennæ a little longer than forewing, simple, basal joint flattened to form a large eye cap. Labial palpi long, curved, smooth, terminal joint as long as second. Maxillary palpi obsolete. Tongue present, weak. Face and head smooth. Anterior wings ovate, obtusely rounded at apex. Hind wings elongate ovate, obtusely rounded at apex. Posterior tibiæ and beginning of tarsi with heavy bunches of hairs above and below. The moth sits with the hinder part obliquely raised from the surface, face closely applied to it, forelegs stretched forward in front and wings roofed over the body. Antennæ extended along the body under the wings and reaching a little outside the apex of these.

Venation. -Fore wings: 11 veins, 5 absent, all separate, 7 to costa; above the end of the cell is a secondary cell which emits veins 9 and 10; 1b simple. Hind wings: 8 veins, all separate.

In spite of the totally different wing form and the presence of labial palpi, the genus reminds one strongly of Leucoptera in general habitus, as in mine and cocoon, but its true affinities are uncertain to me.

PODIASA CHIOCOCCELLA, new species.

(Plate I, fig. 12.)

Antennæ yellowish silvery, light fuscous toward tip, basal joint with large silvery white eye cap. Labial palpi silvery white. Eyes deep black both in living and in dead specimens. Head and thorax silvery white, thorax with two longitudinal light golden yellow streaks. Forewings silvery white, on the apical half overlaid with light and dark fuscous scales. These are arranged in irregular groups and wavy lines, differing somewhat in different specimens, but generally there is found a dark group at basal two-thirds just below costa, which emits a dark streak inward and downward and two short ones upward to costa. Besides these a transverse row of dark scales a little nearer apex and a dark line parallel with the apical dorsal edge are rather constant in all specimens. Just before apex of the dorsal edge is a small round black dot, and the narrow edge around the apex is brown. In some specimens the fuscous scales are also sparsely suffused over the basal half of the wing, especially on the dorsal part, but in most specimens this is pure white.

From base of wing to apical edge are two longitudinal narrow lines of light golden yellow, concolorous with the streaks on thorax. These lines are obscured from the middle of the wing outward under the fuscous scales, but reappear with a somewhat deeper golden color at apex, where there are rather few dark scales; the upper line contains the black apical spot. The earliest bred specimens were the most white, with the fuscous scales light and limited to the apical half of the wing; the later bred specimens were more suffused and more darkly irrorate with the fuscous scales. Cilia yellowish gray at the tip, with a dark line parallel with the dorsal edge. Hind wings and cilia shining silvery white, abdomen yellowish, clothed with sparse silvery white scales. The males sometimes displayed their sexual organ, which was pointed downward and looked like the pappus on a dandelion fruit, consisting of a stalk about 2 mm. long, on the end of which was a globe of white hairs about 1 mm. long. Legs silvery white, with ends of all points light fuscous. Front tibia rough-haired at apex. Posterior tibia with heavy light fuscous tufts above and below; beginning of tarsi with long fuscous hairs, especially above.

Alar expanse, 8 to 10 mm.

Described from more than 20 specimens, bred from *Chiococca racemosa*, collected by Dr. Dyar at Palm Beach, Florida.

Type.—No. 4951, U.S.N.M.

Egg is laid on underside of leaf at the midrib. Mine begins as a long, narrow, serpentine, and broadens out suddenly in a large irregular, whitish, half-transparent blotch, equally visible on both sides of the leaf. The black frass is scattered irregularly. The larval characters are very strange. Up to its last larval molt it is slender, moniliform with the first thoracic segment twice as broad as the head, from thence gradually tapering backward. No trace of either thoracic or abdominal feet. The head is flat, brown, the body white; first thoracic segment with the large semilunar shield black; each of the other segments with one dorsal and one ventral large shining black spot, triangular and smaller on the second and third thoracic segments, rectangular on the others; hairs white. When fully grown, it is about 9 mm. long, casts its skin in the mine and assumes its last larval form, in which it does not eat and which is strangely different from the former stage. Now the color of the head is shining black and the thoracic shield creamy yellowish white. Body very dark purplish red, each segment with a conspicuous laternal spot concolorous with the thoracic shield. But, stranger still, now both the thoracic and the abdominal feet are normal, well developed. The larva cuts a slit in the epidermis and comes out, moving freely about in a looping manner like a geometrid, for which it might easily be mistaken if the number of feet is not observed. It pupates in a fold at the edge of a leaf or in any suitable corner in a roomy glistening white cocoon.

COPTODISCA Walsingham=ASPIDISCA Clemens.

COPTODISCA CONDALIÆ, new species.

Antennæ fuscous, ½ of forewing. Palpi, face, head, thorax, and basal part of fore wing silvery white, in some lights, with golden reflections, especially on vertex. Apical half of forewing golden yellow, with a costal and a dorsal silvery white streak at the beginning of the cilia, nearly uniting so as to form a fascia, black margined on both sides. Just behind is another costal white spot, also black margined behind, and at apex is a large velvety black triangular spot. Outer dorsal edge of wing black. Cilia silvery white, with a single black pencil of hairs at apex continued from the apical black spot. Hindwing dark grey with silvery reflections; cilia paler with golden reflections. Abdomen black above; underside of body silvery white; legs silvery.

Alar expanse, 3.4 to 3.7 mm.

Type.—No. 4952, U.S.N.M.

Described from nine specimens, bred February 12–24 from upper mines in leaves of *Condalia ferrea*, collected by Dr. Dyar at Palm Beach, Florida.

Egg is laid on underside of leaf at the midrib. The mine begins as a short, gradually broadening upper serpentine one, filled with black frass, and ends in a transparent nearly circular blotch, the sides of which the larva cuts out and uses as a case, which is fastened by one short silken band to a leaf or twig. Case is oval, 3 by 1.5 mm. Several mines often found in one leaf. Larva is cylindrical, first and second thoracic segments broad and flattened, body tapering backward. Head is light brown, small, retractile into the first thoracic segment; thoracic shield and anal plate dark brown; body greenish white with a large dorsal and ventral dirty gray spot on each segment. Feet obsolete. This species is very near *C. splendoriferella* Clemens, but has the black in forewing less pronounced both in extent and shade.

BUCCULATRIX Zeller.

BUCCULATRIX IVELLA, new species.

Antennæ silvery gray with darker annulations; eyecaps large, speckled with light brown. Palpi obsolete. Face smooth, white. Tuft on head in front white, above speckled with light brown. Thorax fuscous. Forewings light ferrugineous gray, mottled with brown and fuscous. At beginning of costal cilia is a longitudinal streak of dark fuscous; opposite on the dorsal edge another similar streak, and at apex a third one. A line from base of wing to this last streak just above the fold is light gray, unmottled, while on the fold is a much speckled line; both of these two longitudinal lines, however, are in some specimens interrupted and effaced. Cilia light gray; headwing and cilia silvery gray. Underside of body light yellowish, legs yellow, tarsi nearly white annulated with black.

Alar expanse, 6.5 to 7.5 mm.

Described from 12 specimens, bred from *Iva frutescens*, collected by Dr. Dyar at Palm Beach, Florida.

Type.—No. 4953, U.S.N.M.

The larva at first mines the leaves; afterwards it feeds unprotected on the underside of the leaves. In the latter period it is dirty white with black hairs, head yellow with black eye marks and brown mandibles, tubercles polished white. When full grown about 5.5 mm. long. It reminds one in general appearance very much of the larva of *Plutella maculipennis* Curtis (*cruciferarum* Zeller). The cocoon is of the usual Bucculatrix form, pure white, about 6.5 mm. long.

BEDELLIA Stainton.

BEDELLIA MINOR, new species.

If I had received the types of this species for determination, I should surely have pronounced them small specimens of the common *somnulentella* Stainton, and the knowledge of its food-plant would naturally strengthen this belief.

Fortunately, however, I received larvæ in all stages, and although they also at a superficial examination might be taken for *somnulentella* there are distinct and constant differences aside from the smaller size, and it is undoubtedly a distinct form, developed through long isolation from the cosmopolitan species.

Antennæ as long as forewing, white with black annulations, basal joint enlarged, with large dense pecten beneath, yellowish speckled with black. Labial palpi short, drooping, yellow. Face whitish. Tuft on head reddish yellow with tips of hairs fuscous. Thorax whitish yellow. Forewing light grayish yellow sprinkled with black and fuscous scales, most thickly on apical two-thirds; basal one-third only slightly darkened with fuscous; dorsal margin about as much sprinkled with dark scales as the rest of the wing. Hindwings dark gray, cilia lighter yellowish.

Venation is identical with that of *somnulentella*. Abdomen above dark gray, below silvery yellow with black atoms. Anal tuft ochreous; legs yellow, speckled with black, silvery white on the inside; hairs on posterior tibiæ whitish ochreous; tarsi annulated with black.

Alar expanse, 6 to 6.6 mm.

Described from 12 specimens, bred from Ipomœa, collected by Dr. Dyar at Palm Beach, Florida.

Type.—No. 4954, U.S.N.M.

The species is of a lighter, more yellowish color than most specimens of *somnulentella*. The dorsal unspeckled streak generally found in *somnulentella* is in this species unicolorous with the rest of wing, while the basal part of the wing is more sparsely speckled. Still these points are somewhat variable in *somnulentella*, but of a very large series of *somnulentella* none were as small as the largest *minor*.

Larva feeds in exactly the same fashion as the cosmopolitan species, making irregular clear blotches; the angular pupa is identical in form, possibly a little more robust, and is exposed, attached by the extremities to silken threads.

Larva differs from that of *somnulentella* in the absence of the lateral, yellowish white, polished tubercles, which are found in *somnulentella* on joints 5, 8, and 9, and the subdorsal series of purple spots is very much less pronounced, the entire larva being more uniformly greenish purple.

There is no possibility of the small size being due to unnatural conditions by transferring the larva from the tropical climate northward, as Dr. Dyar bred exactly similar small moths—and nothing but these—on the spot. Besides a very large number of larvæ were examined carefully by the writer and the differences were found to be constant.

METRIOCHROA, new genus.

(Type, *Metriochroa psychotriella* Busck.)

Antennæ a little longer than forewing, simple, basal joint with small pecten beneath. Labial palpi moderate, smooth, slightly curved, in the living insect erected in front of face, in dry specimen porrected, or drooping; second joint with scales projecting at apex, terminal as long as second, rather blunt. Maxillary palpi small but distinct, slightly curved upward, in dead specimen drooping. Tongue moderate, spiraled. Face and head smooth. Forewings elongate, lanceolate, pointed, cell very long. Hindwings very narrow setiform.

Antennæ and middle legs smooth with end of tibiæ thickened. Posterior tibiæ clothed with long spiny hairs above; inner spurs twice as long as outer spurs.

Venation.—Fore wings: 9 veins, 3 and 4 absent, 6 and 7 stalked, 7 to costa, 11 absent, 1 simple. Hind wings: 4 veins, 7 to apex, 6 out of 7; median system represented by a single vein. Cilia 5.

Position at rest more like Tisheria than Gracilaria, body obliquely raised in front and forelegs applied to body. Antennæ are laid along and over the forewings. Before settling down to rest the moth whirls the antennæ in rotary motion and raises the body up and down with an impatient motion, alternately bending and stretching forelegs. The genus is allied to Ornix, but reminds one much of Tisheria and Bedellia.

METRIOCHROA PSYCHOTRIELLA, new species.

(Plate I, fig. 13.)

Antennæ bluish black annulated with white, last joint white. Labial palpi light yellow, with a ring around the middle of terminal joint black. Maxillary palpi white. Face white, vertex white with bluish scales intermixed; sides of head, thorax, and anterior wings dark brown, nearly black, with a bluish metallic luster and with sparse bluish-white scales uniformly intermixed. Cilia dark gray with two apical transverse lines black. Hindwings light purplish grey, cilia darker. Abdomen of the general hue, with the anterior margin of each segment light yellow. Legs yellow; tarsi annulated with bluish black.

Alar expanse, 5.5 to 5.8 mm.

Described from six specimens bred from mines on *Psychotria undata*, collected by Dr. Dyar at Palm Beach, Florida.

Type.—No. 4955, U.S.N.M.

Egg is laid on upper surface of the leaf; mine is a long (15 mm.), winding, narrow serpentine on upper side of leaf, with the black frass deposited in quite regular transverse lines. Gradually it becomes broader (2 to 3 mm.) and ends in a small, oblong (5 to 6 mm.), broad blotch, drawn together longitudinally into one or more ridges, beneath which the larva pupates without forming any cocoon, the mine being simply slightly silk lined. The pupa protrudes when the moth issues.

Larva is most singular; cylindrical, somewhat flattened, with no trace of thoracic feet; in their place three pairs of polished circular plates; five pairs of well-developed abdominal feet, one pair on each of joints 6, 7, 8, 9, 10, counting the head as first joint; no anal feet.

MARMARA Clemens.

MARMARA GUILANDINELLA, new species.

Antennæ ¾, rather thick, with large pecten beneath basal joint, and sparsely ciliated throughout; metallic black. Labial palpi slightly curved, in the living insect reaching vertex, in dead specimens porrected; second joint a little rough with scales projecting at apex, third nearly as long as second, blunt, both joints silvery white, with apex black. Maxillary palpi white, moderate, ascending, clothed with long spreading black hairs, especially at tip. Face smooth, silvery white. Head smooth, silvery white with fuscous scales. Thorax and forewings deep bluish black with metallic reflections; a narrow silvery white fascia at basal third, at middle of costa a silvery white spot and nearly opposite, but a little farther outward, a dorsal one. Farther out in the costal cilia is a third costal white spot. Cilia bluish black with tips white. Hindwings purplish grey, cilia 4, lighter. Abdomen bluish black with silvery reflections; anal tuft silvery grey; legs smooth, black with white annulations.

Alar expanse, 4.8 mm.

Described from a single male in fine condition, bred March 27, 1900, from material collected at Palm Beach, Florida, by Dr. Dyar.

Type.—No. 4956, U.S.N.M.

Larva mines the twigs of *Guilandina bonducella* in the same fashion as *Marmara salictella* in willow branches. Mine is a very long, narrow, irregular serpentine, going upward or downward very near the surface just under the epidermis. Larva is very flat, much incised between the segments, tapering backward; head very flat, mandibles large, projected far out in front of the head. At maturity it assumes a similar wine-red coloration of transverse bands as *salictella.* Cocoon white, spun outside the mine.

The species is quite near to *salictella*, a bred series of which is now before me, but it is smaller, darker, and with the second fascia in *salictella* represented by the costal and the dorsal spot.

The venation in both species is as follows: Forewing elongate ovate; 7 veins, 3 to 5 absent, 8 and 9 absent, 1b simple, 6 and 7 separate, one to each side of the apex. Hindwing setiform, 5 veins; 8 short, 7 along costa to apex, 5 and 6 from common independent stalk from base, 3 and 4 absent. (See Plate I, fig. 14.)

LITHOCOLLETIS Hübner.

LITHOCOLLETIS VERBESINELLA, new species.

Antennæ silvery white with black annulations, last 4 or 5 joints white. Labial palpi silvery white. Face golden iridescent white; tuft on head reddish yellow with a few white scales. Thorax and forewing deep golden yellowish brown. At basal third is a silvery white costal streak directed outward, strongly margined externally with black. At the middle of the wing is a silvery white, outwardly angulated fascia, and at the beginning of costal cilia another similar one, both strongly margined externally with black. Just before apex is a third small silvery white fascia, with a few scattered black scales externally. Cilia light golden yellow. Hindwings dark silvery gray, cilia a shade lighter. Abdomen above, dark gray; underside silvery and golden yellow. Legs silvery with broad black annulations.

Alar expanse, 6.4 mm.

Described from a single specimen, bred from *Verbesina virginica*, collected at Palm Beach, Florida, by Dr. Dyar.

Type.—No. 4957, U.S.N.M.

The larva makes a roomy tent-shaped mine on the under side with the lower epidermis much wrinkled longitudinally, and pupates in an elongate white cocoon suspended at both ends like a hammock inside the mine. Larva belongs to the cylindrical group.

I made no further notes on the larva, and even omitted to write Dr. Dyar for more material to breed from, because I was convinced that it was the mine and larva of *Lithocolletis elephantopodella*, Frey and Boll, which I have bred commonly from exactly similar mines on Verbesina at Washington, D. C. The moth, however, while belonging in the same group with *elephantopodella* and *ambrosiella*, is decidedly different, notably in the more angulated and darker margined first fascia and the complete, angulated second fascia instead of the costal and dorsal streak of *elephantopodella*.

CORISCIUM Zeller.

CORISCIUM RANDIELLA, new species.

Antennæ longer than forewing, grey, each joint tipped with black. Labial palpi long, curved, second joint strongly tufted beneath, especially toward apex, terminal one nearly as long and somewhat rough in front; white with tips grey. Maxillary palpi distinct, smooth, white. Face silvery white. Head white with central parts mouse grey. Thorax mouse grey with two lateral longitudinal white lines. Forewings mouse grey with a golden luster. Three outwardly directed silvery white costal streaks, all thinly black margined, reach nearly to the fold. From base to apex a dark-edged undulating silvery white line with the tops of the three undulations touching the fold and the three bases of these undulations on the dorsal edge. The black margin of the last undulation and that of the last costal streak unite in a small longitudinal spot. Cilia white with a short black dash on the costal side and two short parallel black lines on the dorsal sides. Hindwings light silvery gray. Legs silvery white with deep black annulations on the tarsi.

Alar expanse, 5.8 to 6.1 mm.

Described from 5 specimens bred from *Randia aculeata*, collected by Dr. Dyar at Palm Beach, Florida.

Type.—No. 4958, U.S.N.M.

The egg is laid at the edge of a leaf on the under side; the young larva bores through to the upper side, forming a more or less trumpet-shaped upper blotch extending along the edge of the leaf. When fresh the mine is not much discolored, but when old it becomes whitish brown. Mr. Kinzel says that this species becomes very abundant and injurious to the Randia in summer time.

Larva is cylindrical, with 14 legs, yellow; mandibles light brown. When mature, it is about 4.5 mm. long; it leaves the mine and makes a slight fold on under side of a leaf, drawing the edge down with transverse cables of white silk, under which the oval white cocoon is spun.

CHILOCAMPYLA, new genus.

(Type *Chilocampyla dyariella* Busck.)

Antennæ nearly 1½, simple; basal joint somewhat flattened and enlarged, with thick covering of scales, and with large heavy pecten beneath, giving the appearance of an eyecap, although not thus used; antennæ at rest, being porrected obliquely in front. Labial palpi long, slender, smooth, curved, in the living insect, erected before and kept close to face, reaching the vertex; in dead specimens drooping, laterally divergent; second joint a little thickened at apex; terminal nearly as long as second, pointed. Maxillary palpi moderate, porrected. slightly curved upward. Tongue very long, scaled at base. Head and face smooth; head elongate narrow; face retreating. Eyes large, prominent. Anterior wings narrow, much elongated; in female pointed, and of normal form; in male with a costal depression at two-thirds from base, making the wing one-third narrower at that point, widening out again toward tip, which is rather blunt. The males can at once be distinguished by this peculiarity. Posterior wings setiform; costa excised from basal third to apex.

Venation.—In female: 11 veins; 3 absent, 6 and 7 shortly stalked, 7 to costa, 1^b simple; in the male the costal depression causes a narrowing of the cell and obliterates vein 10; cell widens out again after the costal depression, and venation is otherwise identical with that of the females. Hindwings: 8 veins; 7 to apex; cell open between 4 and 5.

Anterior tibiæ thickened at apex, with smooth scales. Middle tibiæ smooth, thickened at end, with heavy tuft of scales; together with anterior legs prominently displayed, Gracilaria-fashion, when insect is at rest. Posterior tibiæ above with two longitudinal rows of bristles; inner spurs at the end of tibia several times as long as outer spurs.

An offshoot from Gracilaria, and allied to Spanioptila Walsingham, which genus I know only from description; but differing in venation and the smooth middle tibiæ. Also, apparently, by a much more strongly developed pecten on first antennal joint, besides the curved costa of the males.

CHILOCAMPYLA DYARIELLA, new species.

(Plate I, fig. 15.)

Antennæ straw-yellow, indistinctly annulated with a darker shade; first joint and pecten in front deeper yellow, with bluish black edges; posterior side all black. Face, head, and labial palpi light shining straw-yellow; third joint of palpi with a black annulation around the base and one around the middle. Maxillary palpi yellow with tips black. Eyes in the living insect brilliant brick-red, in dead specimens dark brown. Thorax dark straw-colored, shoulders light brown. Forewing: ground color straw-yellow with gray, purple and black scales intermixed. Basal half of costal edge whitish with black dots; reaching from basal fourth to middle of wing and inward; beyond fold is a large, ill-defined, triangular, costal spot, darkest at the edges, with the dark scales predominating. Just before apex is a thin, indistinct, transverse line of white scales.

In the male the portion of the wing just below the costal depression is somewhat deeper yellow and without intermixed darker scales. Cilia dark purple. Hindwings and cilia light purple; the entire insect in some lights with brilliant purple reflections. Fore and middle legs yellow with the enlarged parts of the tibiæ purplish black. Tarsi with purple annulations. Abdomen dark purple above; entire body beneath silvery white.

Alar expanse, 7 to 8.5 mm.

Described from more than 30 specimens, bred February 18 to March 20, 1900, from material collected at Palm Beach, Florida, by Dr. Dyar, in honor of whom this species is named.

Type.—No. 4959, U.S.N.M.

Food plant two species of Eugenia. The mine is one of the most interesting I have met with. Egg is laid on the underside of the leaf and mine begins as a long narrow line along the edge of the leaf for about 25 mm. and then turning inward it suddenly broadens out in a large bladder-like blotch nearly covering the entire leaf. The upper and lower epidermis are separated and the leaf is inflated and yields to pressure like an air cushion, being from 3 to 6 mm. thick. Mine shows whitish green on the underside, discolored with purple on the upperside. The inside of the mine looks as if overgrown with a small, whitish pearly fungus, and before I had examined it carefully and found the larva and the early part of the mine I took the phenomena to be the result of a fungous disease. Inside this roomy mine is found a cylindrical, clear, transparent larva with sparse white hairs and with 14 legs. Head is light brown with darker reddish brown sutures and two black eyespots.

When full grown, it is about 4.5 mm. long; it comes out of the mine, turns vivid wine red, and spins a dense, oval, yellowish grey cocoon in a slight fold on leaf. The average cocoon measures 7 by 4 mm. The pupa is at first white, with black eyes, part of which the enlarged first antennal joint covers; the antennæ reach far beyond anal tip. On the front of the head is a stout, sharp, brown spine, used to cut the cocoon when the imago issues.

When mature the pupa assumes the coloration of the imago. The pupa stage lasted in a warm room about three weeks. The pupa shell is left protruding from the cocoon. Position of imago at rest like that of Gracilaria, but with antennæ porrected obliquely in front.

EUCOSMOPHORA, Walsingham.

EUCOSMOPHORA SIDEROXYLONELLA, new species.

Antennæ $\frac{5}{4}$, simple, basal joint without pecten, dark fuscous at base with a cupreous sheen. At rest, porrected straight in front of the insect. Labial palpi long, smooth; third joint as long as second, in the living insect recurved, overarching the vertex, kept rather far from face; in dead specimen laterally divergent. Color bright golden. Maxillary palpi small but distinct, golden. Eyes in the living insect brilliant coral red. Head and thorax smooth, shining metallic golden. Forewings bright metallic golden with cupreous reflections. Seen under a lens the basal and apical part of the wing is pure gold, the intervening space coppery, but the reflections are so strong on both colors that the entire wing sometimes appears all gold, while in other lights the cupreous predominates. From the base is an elongated, costal, black streak, extending nearly one-fourth of the wing and interrupted before the middle by two golden dots. About the middle of the wing is another elongated, narrow, subcostal black streak with bright metallic blue reflections. Opposite it, on the dorsal edge, begins a third elongated black streak, extending obliquely upward and outward nearly to the costal margin, and from there to apex. The portion of the wing below and outside this line is in some lights dusky black with bright golden streaks, but in other lights the black is obliterated by the strong golden reflections. Cilia and hindwings dark grey, with bronze reflections. Abdomen dark fuscous, with bronzy reflections. Legs golden; posterior tibiæ clothed with rather short, stiff, spiny hairs above; middle tibiæ smooth; underside of body silvery white.

Alar expanse, 8 mm.

Described from a single specimen, bred February 27, 1900, from mastic (*Sideroxylon pallidum*) collected at Palm Beach, Florida, by Dr. Dyar.

Type.—No. 4960, U.S.N.M.

I am not acquainted with this genus except through Lord Walsingham's description, but I have little doubt that this species belongs to it, although the single specimen does not allow a thorough examination of the venation. It is a splendid, shining little insect, which "ought" to go in the genus Eucosmophora (who carries a beautiful ornament). It seems very near *E. dives* Walsingham, but there is no trace of any white costal spot, nor any white at all on the forewing, as is the case with *E. dives.*

The larva is cylindrical, with 14 legs, yellow, with darker yellow head and brown mandibles. It mines the upper side of young leaves of Sideroxylon, at the same time drawing the leaf longitudinally into a roll or fold, which covers up the mine out of sight.

GRACILARIA Haworth.

GRACILARIA BURSERELLA, new species.

Antennæ longer than forewing, purplish gray, becoming gradually lighter outward, silvery white at tip. Labial palpi white on the outside with purple shadings and tip of terminal joint black. Maxillary palpi moderate, porrected, white. Face white. Head and thorax yellowish brown with strong purple reflections; forewing brown with strong purple reflections; along costa a shade lighter, more yellowish. Small irregular black dots all over the wing; just before tip an indistinct narrow, black fascia; cilia dark gray. Hindwing dark purplish gray. Cilia lighter. Abdomen dark purple, underside white, speckled with purple, legs white with brown shadings; tuft on middle tibia dark purplish brown.

Alar expanse, 9.6 and 10.4 mm.

Described from two males, bred February 21, 1900, from *Bursera gummifera*, "gumbo-limbo," collected by Dr. Dyar at Palm Beach, Florida.

Type.—No. 4961, U.S.N.M.

Larva is cylindrical, yellow, without markings; 14 feet. At first it makes a small triangular mine between midrib and another rib on underside of the leaf. Afterwards it folds the edge of the leaf downward. The species is quite near to *G. violacella* Clemens.

GRACILARIA SEBASTIANIELLA, new species.

Antennæ longer than forewing, shining fuscous. Labial palpi whitish with tips fuscous. Maxillary palpi white. Face whitish. Head and thorax yellowish. Forewing yellowish fuscous; from costa at basal third, directed obliquely inward, is a narrow white fascia; at middle of the wing is a dorsal white streak, parallel with the fascia and reaching to the fold. At apical third of the wing is a costal whitish streak, perpendicular to the dorsal streak and also reaching the fold. Extreme tip of wing and the adjoining cilia white with a black dot on apex. All of these white markings are strongly margined internally with black. At apical fourth, between the last costal streak and apex, is an oval black spot with the center white and the entire costal edge is slightly mottled with black. Cilia dark fuscous with a whitish line parallel with the dorsal edge. Hindwings and cilia dark gray. Abdomen dark fuscous, anal tuft yellowish. Legs silvery yellow; tarsi with black annulations.

Alar expanse, 7.6 to 8.4 mm.

Described from 3 specimens, bred from *Sebastiania lucida*, collected by Dr. Dyar at Palm Beach, Florida.

Type.—No. 4962, U.S.N.M.

Larva makes a brown, irregular, elongated upper blotchmine, with the upper epidermis drawn into a longitudinal ridge. It leaves the mine and spins its white cocoon in a sharp fold at the edge of the leaf.

PHYLLOCNISTIS Zeller.

Of the American species placed under this genus *P. ampelopsiella* Chambers, *liriodendronella* Clemens, *populiella* Chambers, *vitifoliella* Chambers, *vitigenella* Clemens, and *liquidamberisella* Chambers all conform well with the definition of that genus. So does *P. magnoliaella* Chambers, the imago of which has never been described, but which I have bred and found to be a distinct species.

P. smilacisella Chambers is known only from the mine, and is unknown to me except from description.

The imago of *P. erechtitisella* Chambers has never been described, but I have bred a large series of it from *Erechtites hieracifolia.* I have also a large series of *P. insignis* Frey and Boll bred from *Senecia aureus.* The mines of both are among the earliest found in spring, and several generations are produced during summer until late fall. The insects overwinter as imago like the other species of the genus. Living material of both is now before me, and I am unable to find any difference between them in any stage. Frey's name must stand. Dr. Edward Meyrick, of England, has kindly called my attention to the fact, that this species is not a true Phyllocnistis, according to the present definition of that genus. *P. insignis* has the antennæ somewhat longer than the forewings instead of somewhat shorter, and the basal joint is in no way dilated into an eyecap. Frey says about his type of this species: "Wir glauben über die generishe Stellung des reizenden Thierchens uns nicht zu taüschen," and gets out of the difficulty by stating: "Fühler defect."

Otherwise, in venation, characters of the palpi, head and posterior legs, it agrees perfectly with Phyllocnistis and the general pattern of the wings is also much like this genus.

As the early stages and the work and habits of this species are also identical with those of the genus, I should propose to widen the definition of Phyllocnitis rather than to erect a new genus, the more so on account of the following newly discovered Florida species, which is an intermédiate form.

It has the antennæ shorter than the forewing and has a slight indication of an eyecap; also in coloration it comes between the "red" *insignis* and the "white" undoubted Phyllocnistis group, although it is nearest to the former.

PHYLLOCNISTIS INTERMEDIELLA, new species.

Antennæ nearly as long as forewing, silvery yellow, basal joint slightly enlarged and flattened. Labial palpi silvery white, pointed, drooping. Maxillary palpi obsolete. Head and thorax light silvery gray, anterior wing, basal two-thirds silvery gray, somewhat lighter than in *P. insignis* Frey and Boll, but not the pure white as in the grape-feeding species. In the costal part of the wing, beginning at base and reaching to the apical third of the wing is a sharply defined, light-golden, spindle-shaped streak, nearest to the costal margin at base of wing, nearest to the fold at apical third.

The first part of apical third of the wing is evenly overlaid with dark gray, then follows a large oval bright orange-colored black-centered spot, and just at apex is a large deep black dot emitting into the white cilia five black streaks, three into the costal and two into the dorsal part. The cilia is very long, dorsal and costal part about equally developed, and it has besides these five black streaks one more costal, directed toward the base of wing, and in the dorsal part is a dark fuscous streak, parallel with the dorsal margin. Hindwing dark gray; cilia 5, silvery white. Abdomen above dark fuscous, below silvery white. Legs silvery white, last joint of tarsi black. Posterior tibiæ with long stiff bristles above.

Alar expanse, 4.2 mm.

Type.—No. 5189, U.S.N.M.

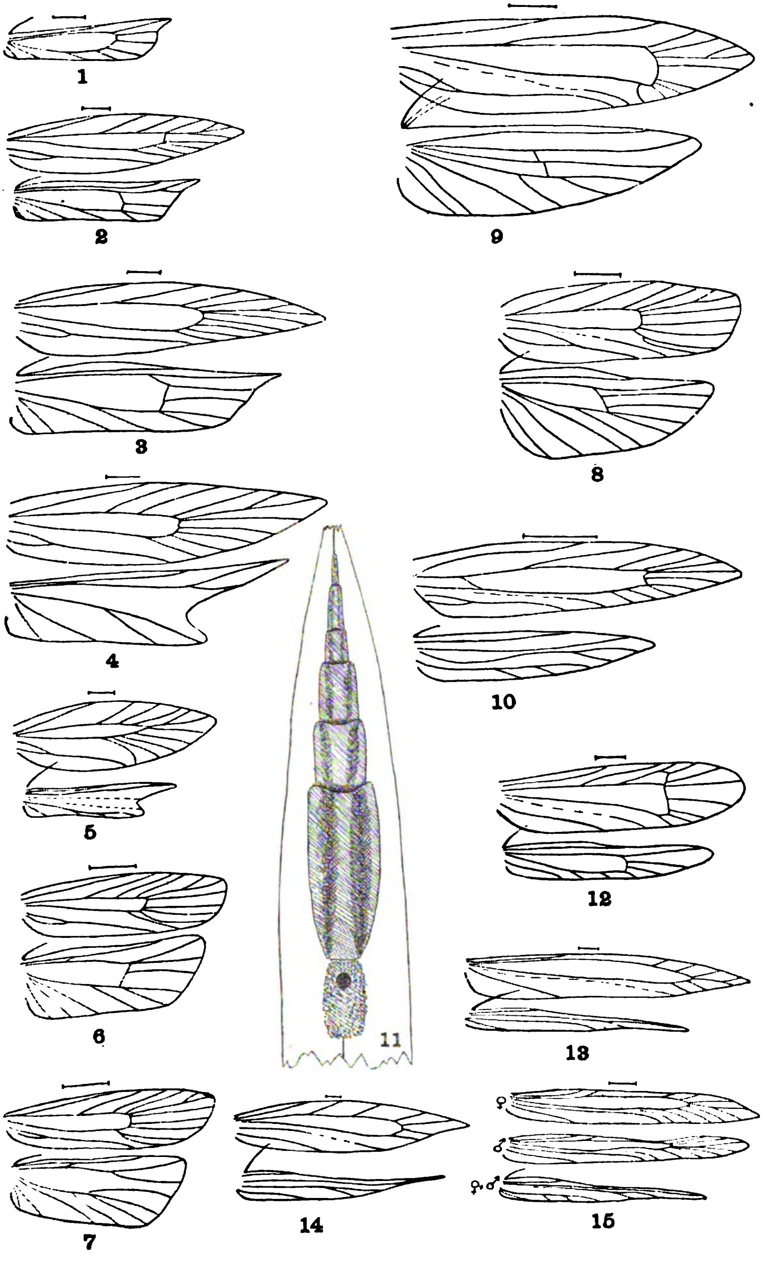
Bred during early February from leaves of Mastic, *Sideroxylon* (*Masticodendron*) *pallidum*, collected by Dr. Dyar, at Palm Beach, Florida.

The mine is on the underside and of the usual Phyllocnitis type; a long, whitish, irregular serpentine just below the epidermis, confined to one side of the leaf, not crossing the main rib. Total linear length of an average mine about 10 inches; ending at the edge of the leaf, where a little pucker is made, the leaf slightly drawn, and the cocoon formed within the mine.

In a few cases mines were found on the upper side of the leaf.

EXPLANATION OF PLATE I.

Fig. 1. Venation of *Aristotelia ivae* Busck.
2. Venation of *Aproaerema crotolariella* Busck.
3. Venation of *Gnorimoschema terracottella* Busck.
4. Venation of *Didactylota snellenella* Walsingham.
5. Venation of *Nealyda pisoniae* Busck.
6. Venation of *Anacampsis lagunculariella* Busck.
7. Venation of *Trichotaphe melantherella* Busck.
8. Venation of *Depressaria amyrisella* Busck.
9. Venation of *Blastobasis guilandinæ* Busck.
10. Venation of *Homaledra heptathalama* Busck.
11. Gallery of *Homaledra heptathalama* Busck (natural size).
12. Venation of *Podiasa chiococcella* Busck.
13. Venation of *Metriochroa psychotriella* Busck.
14. Venation of *Marmara salictella* Clemens.
15. Venation of *Chilocampila dyariella* Busck.



VENATION OF TINEID MOTHS.

FOR EXPLANATION OF PLATE SEE PAGE 254.

UNIVERSITY OF CALIFORNIA

LIFE HISTORIES OF SOME NORTH AMERICAN MOTHS.

By Harrison G. Dyar, Ph. D.,
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The following early stages of some North American Lepidoptera have been recently observed. With a few exceptions the full life history of each is given.

CAUTETHIA GROTEI Henry Edwards.

Egg.—Slightly elliptical, well rounded, not flattened, resting on the leaf only narrowly; shining bright green, minutely shagreened, but also with obscure, linear, rather small reticulations. Size 1.2 by 1.1 by 0.9 mm. Laid singly on the back of leaf.

Stage I.—Head rounded, clypeus reaching to the middle of the front; pale ochraceous greenish, mouth darker; not shining; width 0.5 mm. Body cylindrical, normal, joint 12 squarish with a long (1.5 mm.) erect horn, bearing setæ i on the vertex and finely setose. Segments finely, weakly 8-annulate, shining, punctate with pale dots. Translucent yellowish, green from the food. Horn brown-black, stained with red around the base. Tubercle i is on the third annulet, ii on the sixth, iii on the fourth, iv a little posteriorly, on the fourth, substigmatically, v very anterior on the first annulet and higher than tubercle iv; two setæ on the leg shield. Setæ fine, stiff, straight, not swollen, i to iii dark brown, iv and v pale. Shields and plates concolorous, uncornified.

Stage II.—Head round, soft green, ocelli black; width 0.8 mm. Body same soft green, covered with fine, secondary, pale granules; obscurely 8-annulate. A faint, pale, subdorsal line. Horn long, brown-black, setose, stained with red around the base, this color running a little up the dorsal line. Body pilose; feet pale, thoracic feet reddish at tips.

Stage III.—Head squarish, rounded, clypeus broad, not reaching the middle of the front; soft green with secondary white granules;

width 1.2 mm. Body cylindrical, segments 8-annulate, uniform; anal feet large, the foot plates pointed behind. Horn long, luteous, reddish at base and tip, pilose and with large apical setæ (tubercles i). Body densely pale granular, without lines, light green. Spiracles concolorous.

Stage IV.—Head as before; width 1.7 mm. Horn green, reddish at tip and with a brown streak above at base, with sparse, short, black hairs. Apical setæ still distinguishable. Body light green, pale granular, minutely pilose. Spiracle of joint 5 black, the rest pale brown. Feet green; no lines, no shields. Horn 4 mm. long. Segments uniform, all of equal thickness; subventral fold rather distinct; 8-annulate.

Stage V.—Described by me some years ago in another place.[1]

Food plant.—The larvæ were occasionally met with on the *Chiococca racemosa* at Palm Beach, Florida.

AMPHONYX ANTÆUS Drury.

A newly hatched larva of this fine Sphinx occurred to me at Palm Beach, Florida, in February, on the custard apple (*Anona laurifolia*). It was bred in Washington, D. C., the food plant being supplied to me by Mr. F. Kinzel. The moth emerged in July.

Egg.—Elliptical, slightly flattened above and below, rounded, normal; shell white, thin, densely granular shagreened; probably green before hatching; size 2.4 by 2 by 1.8 mm.

Stage I.—Head round, free from joint 2, slightly bilobed; clypeus small, weakly shield shaped; yellowish green, ocelli black, labrum white; width 1 mm. Body cylindrical, equal, incisures not depressed, joint 12 a little enlarged, with a long (3.7 mm.), stout, nutant horn, straight, directed obliquely backward; anal plate large, triangular, with a stout, erect horn (0.5 mm.) each side of the middle, between which the horn of joint 12 fits when depressed. Segments very finely annulate, horn subsegmented, shortly furcate, pilose, but minutely so. Pale green, the folded incisures more yellowish; horn black, reddish about the base. Setæ slender, rather long, with minutely enlarged tips, pale and obscure, normal, i dorsad to ii, v above iv and anterior, a seta on the leg base. Tubercles imperceptible.

Stage II.—Head flat before, highly conical, the lobes produced into short cones which are closely approximate and contiguous, pointing obliquely forward; clypeus small. Pale green, shagreened, not granular, a faint brown line on the face of the lobe, more distinct as it reaches the vertical cone; mouth whitish, ocelli partly black; a dark shade on the median suture behind the vertex where the head rises above joint 2; width 1.6 mm. Body cylindrical, 8-annulate, minutely pilose, granular; horn long (5.5 mm.) and thick, with furcate tip, irregular, rather sparsely spinose. Yellow green, greener dorsally; horn pale red brown toward the base, especially at the sides and at tip; a black line outwardly on thoracic feet; anal flap triangular, nearly reaching the end of the anal foot plates, which are rounded triangular; spiracles pale ocherous. Subdorsal horns of anal plate, short cones; horn depressed obliquely and touching the leaf stem far behind the larva. Later the sides are obliquely shaded, but the only true lines that appear are the oblique on 12 to 10 and the longitudinal subdorsal on the thorax. The body fills out posteriorly, joints 2 to 4 being smaller than the rest and tapering to the large head.

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[1] Psyche, VII, p. 385.

Stage III.—Head highly triangular, the doubly pointed apex curving in front, making the flattened face look concave; green, sides a shade darker, a pale line from the ocelli to vertex. Sparsely granular, subspinose in front before the apex, tips of lobes yellowish, with a faint line down the back of each, of same color; width 2.5, height 4.5 mm. Body robust, small before; horn large (8 mm.) and very thick, slightly arcuate backward, extended nearly longitudinally. Green, with distinct elevated pale-yellow granules; faint subdorsal and subventral yellow lines on thorax and an oblique on joints 12 to 10. Shaded faintly with whitish, leaving a darker dorsal and faint oblique shades on joints 5 to 11. Spiracles brown, paler at top and bottom. Horn densely spinose, with thick, conical, irregular tubercles, black on the dorsal (anterior) half, greenish yellow below, but the tips of the spines black. Abdominal feet green; thoracic ones black outwardly. Anal shields green, black punctured, a slight, pale tubercle representing the former subdorsal horn. Anal flap rounded triangular.

Stage IV.—Head shaped as before, held obliquely so that the vertex points forward and the back of the head is level with the dorsum; green, sparsely granular, subspinulose toward the horn-like apex; two whitish lines on the side of each lobe and one on the back, running to the vertex; width 4 mm. Body robust, smaller before, annulate, sparsely yellow granular, the granules pilose and also considerable pile between them without basal granules. Green, dorsal line darker, olivaceous, without granules; an oblique yellow stripe from the horn to joint 10, the faint whitish lateral clouding shaded obliquely darker on joints 5 to 9. Anal plates triangular, smooth, punctate with dull ocherous. Spiracles brown, yellow at top and bottom and in a narrow vertical central line. Horn very large and thick, coarsely, densely, conically spinose, olivaceous yellowish below. Abdominal feet green; thoracic ones black, with coarse pale granules, the basal joint black only in an outward stripe. Later the dorsal band becomes purplish, especially on joints 5 to 11, edged with paler.

Stage V.—Head highly conical, but without the points of the previous stage; vertex rounded, median suture impressed, clypeus very small, about one-fourth the height of head, vertical membranous triangle visible on the back, not reaching halfway to the conical apex;

finely shagreened, also with minute, sparse, smooth granules and a very few secondary hairs toward vertex; green, slightly shining, a very obscure paler band up the anterior angles from ocelli to vertex and a fainter one on occiput from base of vertical triangle; apices of lobes slightly yellowish; jaws black; labrum furcate, brownish; antennæ mostly pale; ocelli brown shaded except the upper and lower ones; width 7 mm. Body large, robust, smaller before; anal plates large and thick; joint 12 enlarged dorsally with an enormous thick club-like horn, studded thickly with cones, the end rounded, not pointed. Segments 8-annulate, the ordinary granules minute, but the sparse ones distinct and pale with rather long and distinct brown secondary hairs, perfectly visible without a lens. Green, a dorsal vascular line shading into purple, bordered with yellowish posteriorly (joints 6 to 10), the lateral obliques very faint dark shades, lighter edged, except the one on joints 12-10, which is a very distinct, broad, white line edged with dark green before. Horn olivaceous lilac above, the studding cones pale ocherous with brown tips. The three anal-plates are rounded triangular, green, covered with large slightly elevated yellowish brown granules, faintly circled with yellow. Other abdominal feet green, the claspers black; thoracic ones yellowish white, streaked and spotted with black, with a few small whitish granules. Spiracles large, dark brown, shading paler above and below, with a central vertical white line. Later the horn became dark violet above, the dorsal stripe violet, broad and distinct, narrowing anteriorly to obsolescence. The larva entered ground and formed a cell in the earth.

EUPSEUDOSOMA INVOLUTUM Sepp.

Phalæna involuta Sepp, Surin. Vlinders, III, 1852, pl. cxv.
Charidea (?) *nivea* Herrich-Schäffer, Ausser. Schmett., fig. 279, 1855.
Halisidota nivea Walker, Cat. Brit. Mus., XXXI, 1864, p. 308.
Eupseudosoma niveum Grote, Proc. Ent. Soc. Phil., V, 1865, p. 240.
Eupseudosoma involutum Kirby, Cat. Lep. Het., I, 1892, p. 205.—Druce, Biol. Cent.-Am., Lep. Het., II, 1897, p. 391.

Variety FLORIDUM Grote.

Eupseudosoma floridum Grote, Can. Ent., XIV, 1882, p. 187.—Smith, List. Lep. Bor. Am., XXVI, 1891.—Kirby, Cat. Lep. Het., I, 1892, p. 205.—Neumoegen and Dyar, Journ. N. Y. Ent. Soc., I, 1893, p. 174.
Euchætes immaculata Graef, Ent. Amer., III, 1887, p. 42.

The variety *floridum* lacks the blackish bars that occur on the discal and submedian folds of the fore wings of the typical form. It occurs exclusively in southern Florida. The larva resembles that described and figured by Sepp, but the food plants which I observed were different. Sepp states that his larvæ were found on guava (*Psidium pyriferum*); mine were found only on the wild species of Eugenia.

The moth has been placed in the Arctiidæ, and Sir George Hampson, in his recent monograph of the Syntomidæ, omits the genus, thereby confirming the reference. However, the larva is an unequivocal Syntomid, showing the typical structure. The moths of the Syntomidæ and Arctiidæ are separated only by the absence of vein 8 of the hind wings in the former. Hampson does not use this character absolutely, for he includes Eucereon in the Syntomidæ, though some of the species have a rudimentary vein 8 present, and he excludes Halisidota, though some species have vein 8 nearly absent. The larval characters confirm both of these references, but not so with Eupseudosoma. In the latter genus the female has vein 8 entirely absent; the male has a short vein, not reaching the costa. Even on these characters Eupseudosoma might well be included in the Syntomidæ; but when we consider that the subcostal vein in the male is probably secondary, merely a brace for the large costal lobe, it renders the reference more likely.

The larva presents during ontogeny the usual gradual appearance and disappearance of characters adapted to its habits at its different stages. But there is one very unusual feature, which is worthy of special mention. The head is immaculate in all stages but one—the penultimate. Then it assumes a large and peculiar marking. This would not be remarkable if it appeared in the last stage, but to suddenly appear for one stage only and then completely disappear is unique in my experience. It may be noted that the mark is normal in the Syntomidæ, being present in all stages of *Lymire edwardsi*, showing in *Ctenucha virginica* and indicated in *Scepsis fulvicollis;* but the cause of its sudden appearance in one stage of *Eupseudosoma floridum* is far from clear. The general appearance of the rest of the larva does not change while the head is undergoing its transformation, and the head is not conspicuous, being more or less concealed by the hair. The mark was constant in all my 20 larvæ.

Egg.—Slightly more than hemispherical, base flat, apex very slightly produced, suggesting the conoidal shape; clear yellowish green with amber lights about the edges, later opaque whitish green; reticulations small, regular, rounded hexagonal, slightly raised, smaller just around the micropyle, forming a ring of small cells with one central one; micropyle eccentric, a little to one side of the vertex of the egg; diameter, 1.1 mm.; height, 0.5 mm. Laid several together or in a mass on the back of a leaf, not touching, often rather remote and scattering.

Stage I.—Head rounded squarish, slightly bilobed, clypeus high, the paraclypeal pieces nearly reaching the vertex; free from prothorax; antennæ moderate; primary setæ short, black, distinct; i and ii rather near the vertex, iii at the middle of the lobe, iv close to ocelli, three behind the circle of ocelli (one inclosed), two below, rather approximate above the antenna. Colorless, a yellow patch showing from within by transparency; jaws, brown; ocelli, black; width, 0.45 mm. Body arctiiform with large tubercles and thick spinulose white hairs. Segments short, contracted, the incisures distinct; no shields. Tubercles ia+ib+iia on joints 3 and 4, distinctly united on a flattened, somewhat fan-shaped wart; iib small, remote, posterior; iv large; vi dark. On the abdomen tubercle i small, dark; iv stigmatal, posterior, rather small; v larger. Setæ single, no subprimaries. Body a little flattened, the lateral tubercles, especially of joints 3 and 4, a little prominent. Translucent whitish, tubercles ii and iii on joints 11, 12, and 13 anteriorly dark ocherous. Hairs white; legs colorless; the anal feet divergent. On eating, the larvæ became green from the food, the ocherous tubercles faded to a dull color, joint 2 became contracted, and joints 3 and 4 hunched up.

Stage II.—Head flat before, rather strongly bilobed, colorless, mouth brown; width, 0.65 mm. Body a little flattened, joints 3 to 5 largest, joint 2 retracted and weak, joint 13 small. Warts moderate, spherical, with rather dense, white, stiff, spinulose hairs, those of joints 3 and 4 the longest, very few on joint 2, the shield obsolete; prespiracular and subventral warts present, slender, produced. On joints 3 and 4 one wart above the stigmatal wart, discrete, round, produced. On the abdomen wart i small, ii large, iii small, iv about the same size, v small, vi larger on the somewhat produced subventral fold. No anal plate, but warts on the flap. Feet rather slender, pale, with colorless plates. Luteous whitish, the sides washed with pale vinous; deeper vinous about the subdorsal tubercles of joints 3 and 4 and below ii and iii of joints 5, 6, and 10; on 11 to 13 this color is more distinct, forming streaks running downward and forward from wart ii, on joints 12 and 13 changing from vinous to dull orange red. Skin smooth, not shining.

Stage III.—Head squarish bilobed, clypeus rather high, faintly luteous, a vinous spot within at apex of paraclypeal pieces; ocelli black, jaws only faintly brown; width, 0.9 mm. Warts rounded, produced, colorless, except the subdorsal ones of joints 3 and 4, which are vinous tinged, and ii of 12 and 13, which are orange. Wart i small, ii and iii large, iv and v small, vi large, produced. Color as before, but the vinous shading covers the dorsum on joints 3 to 10.

Stage IV.—Head rounded, slightly bilobed, clypeus reaching half way to vertex; pale testaceous, jaws black at tip; ocelli black, five in a semicircle and one below behind the antenna. Body short and thick, pale testaceous, vinous tinged, especially in dark, oblique streaks over warts ii and iii on joints 11 to 13. Warts rounded, elevated, colorless. Hair dense, stiff, flesh colored with black tips, barbuled. A diffuse black dorsal patch on joint 5, the hair from tubercle i and part of ii short and black. A slight similar shade on joint 10. Later rusty brown, the green food showing only dorsally on joints 10 to 12. Black patches diffuse.

Stage V.—Head as before, the antennæ rather long; width, 2 mm. Body the same, nearly colorless, only faintly brown or vinous tinged, the posterior dorsal marks nearly obsolete. Marks replaced by very dense hair, but the large, diffuse black dorsal patches are present on joints 4 to 6 and 9 to 10. Hair bright brown with short black tips, all even, only a few long pale ones overhanging the head. A slight, black, crested tuft on the upper side of tubercle i on joint 5, as long as the other hair. Hairs brightest, most reddish centrally, the end and subventral ones without black tips. Feet all pale. Hairs rather long, barbuled, the tips formed by three or four black barbules in a terminal group; the barbules on the shaft concolorous with the hair. The larva looks like a brown hairy gall on the back of the leaf.

Stage VI.—Head rounded, scarcely bilobed, pale whitish, a large, thick, inverted U-shaped black mark bordering the clypeus and throwing out a short spur at the side below. Antennæ rather long, pale; labrum whitish; width, 2.5 mm. Body flattened ventrally, rounded, thickest at joint 5 and a little depressed at the ends, entirely covered by the dense, brush-like hair. Pale yellowish, scarcely translucent, warts concolorous, no marks whatever. Hair dense, even, and regular, pale yellow, spinulose, the ends slightly brown tufted. On the subdorsal wart of joints 3 and 4 a long, slender, white pencil of two or three hairs, rather densely feathered, spinulose. Warts i to vi all large and rather contiguous, rounded, hemispherical, the single subdorsals of joints 3 and 4 a little elongated transversely. No trace of the tuft on joint 5 of former stage. During the stage the hair becomes dark yellow.

Stage VII.—Head pale yellow, a diffuse reddish shade over the face of each lobe, the paraclypeal pieces grayish and some gray dots on clypeus; labrum, epistoma, and antenna white; ocelli brown, jaws black at tip; the black U-shaped band entirely absent; width, 3.5 mm. Body as before, thickly covered with a brush of yellow hair, even, spinulose, the ends pointed, not tufted; four slight and slender pencils of white hairs arise from the subdorsal warts of thorax. Body and warts pale yellow like the hairs, without marks. Later the head becomes dark orange red. Other larvæ, alike till this stage, came out with variously colored hair—bright yellow, mouse gray, chocolate brown, and orange red, the color always residing in the distal third of the hair in the spinulose part, the heads and bodies not affected, being all alike in color. All the thoracic pencils were white. Later the color dulls so that there are only two forms, yellow and chocolate brown, which continue distinct till maturity.

Cocoons composed of the hair felted in a delicate web of silk. Pupa dark brown, concealed by the cocoon.

Food plants.—*Eugenia buxifolia*, *E. procera.*

EUCEREON CONFINE Herrich-Schäffer.

Charidea confinis Herrich-Schäffer, Ausser. Schmett., fig. 277, 1855.
Galethalea confinis Butler, Journ. Linn. Soc. Lond., XII, 1876, p. 424.—Druce, Biol. Cent.-Am., Lep. Het., I, 1884, p. 80.
Nelphe confinis Kirby, Cat. Lep. Het., I, 1892, p. 172.
Eucereon confine Hampson, Cat. Lep. Phal. Brit. Mus., I, 1898, p. 508.

Variety CAROLINA Edwards.

Nelphe carolina Hy. Edwards, Ent. Amer., II, 1887, p. 166.—Smith, List. Lep. Bor. Am., 1891, p. 27.—Kirby, Cat. Lep. Het., I, 1892, p. 172.
Eucereon carolina Neumoegen and Dyar, Journ. N. Y. Ent. Soc., I, 1893, p. 173.

The variety *carolina* from southern Florida differs from the type form in that all the brown spots of the fore wings are smaller and narrower. I have *confine* from Mexico and Venezuela, and they constantly differ from the Floridian specimens by the larger, more rounded spots, contrasted on the more whitish, less uniformly ocherous-tinted ground color. The larva of the stem form has not been described, so no comparisons can be made. Our larva is a true Syntomid.

Egg.—Shape of two-thirds of a sphere, rounded, smooth; white, translucent, with a pale green tint, not shining. Reticulations small, irregularly hexagonal, slightly raised, about alike all over, distinct; diameter, 0.9 mm. Laid singly on or adjoining the food plant.

Stage I.—Head slightly bilobed, whitish testaceous, clypeus high, ocelli black, mouth brown; width, 0.4 mm. Body all white, the shields concolorous, tubercles large, arctiiform, faintly slaty. Feet normal, arctiiform. Setæ long, stiff, pale, ii black as well as iii, but posteriorly the long black hairs have pale tips. Warts i to v present, single haired, no subprimaries; leg shields pale slaty like the tubercles; i and iv small. On the thorax ia+ib+iia, large, iib separate, posterior, small. Cervical shield small, reduced, concolorous. Setæ ia and ib of joints 3 and 4 are black, iia white, but all on a single wart with a projection behind. Later the larva is pale yellowish, the food faintly green; tubercles pale, a little darker on the rims. Joint 2 retracted and with very weak shield; no anal plate.

Stage II.—Head rounded, slightly bilobed, pale greenish yellow, ocelli narrowly black; width, 0.5 mm. Body arctiiform, normal, pale yellow, a dark shade from the food. Warts large, perfectly concolorous; hairs long, straight, and rather stiff, deep black and pure white mixed, black predominating dorsally, white subventrally. Joint 2 small and retracted; joints 3 and 4 rather large. Feet all pale, no shields. Only one subdorsal wart on joints 3 and 4; wart i of abdomen small, as also iv and v, but all several haired. Toward the end of the stage traces of a double white dorsal line appear.

Stage III.—Head broad, round, bilobed; clypeus reaching about two-thirds to vertex; ocelli black, 5 in a semicircle and one below; jaws with 5 cusps, the upper and lower ones short, the middle one the longest; width 1 mm. Body pale yellow with a black dorsal line on joints 3 to 12, broken at the ends, dotted and not definitely edged. Feet large, pale. Warts moderate, concolorous; hair abundant, long, but of irregular lengths, longer at the ends, joints 3 to 5 and 12, 13; coarsely gray, from a nearly even mixture of black and white; rather stiff, spinulose, the long ones finely pointed. Food greenish; joint 12 at the sides a little more yellowish than elsewhere. Later the black dorsal line cuts a series of white, irregularly diamond-shaped dorsal spots on joints 5 to 11, two on each segment, the anterior one smaller, confluent; also a narrow yellow subdorsal line on joints 5 to 11 below wart ii.

Stage IV.—Head pale yellow, ocelli and jaws black, labrum white at tip; broad, rounded, held out flat; width 1.8 mm. Body and warts colorless, slightly yellowish, especially at the sides of thorax and joint 12, sordid green from the food. A broad olivaceous black dorsal stripe, reaching tubercle ii, widened in the centers of the segments, reaching joints 3 and 12, replacing the former white; a yellow subdorsal line below wart ii on joints 5 to 11, broken in the incisures. Hair irregular, stiff, straight, abundant, black and white, the white much predominating; a number of hairs at the ends much longer; barbuled. Warts i to iii and vi large, almost contiguous; i a little smaller; iv and v minute. Joint 2 retracted, hairless dorsally; joints 3 and 4 with one large subdorsal wart. Superficially the larva resembles *Hyphantria cunea.* Later the dorsal black becomes again partly white, forming a dorsal white band narrowing at wart i, widening to ii, and containing dorsal and addorsal, somewhat pulverulent, black lines, except posteriorly where the band remains all black.

Stage V.—Head round, not bilobed, black, slightly shining, the sutures of the moderate shield-shaped clypeus and median suture narrowly olive green as also epistoma and antennæ, including basal joint; tip of labrum, palpi, and ocelli also pale; width 2.9 mm. Body a little flattened ventrally, arched, a little narrowed at the ends; joint 2 retracted and nearly without hairs; anal flap with warts. Warts large, rounded or elliptical, one subdorsal on joints 3 and 4, a pale space indicating seta iib; on abdomen i to iii and vi large, iv and v small, but distinct warts. Body black dorsally and on centers of segments down to the feet; pale greenish ventrally and in incisures up to the level of wart iv where is a trace of a white stigmatal line, only intersegmentally. Warts dull flesh color, contrasting with the body. Hair mostly black, but mixed with gray and white, especially subventrally, the long hairs at the ends of the body white on the apical third. Hair long, rather even, coarse, spinulose, the long ones at the ends numerous. Feet all pale, as also the incisures narrowly, seen when the body is bent. Spiracles white; joint 2 all pale greenish. A slight black dorsal tuft on joint 12.

Cocoon spun on a leaf, elliptical, flattened below, made of hairs and silk, the hairs forming a point at one end, all as in *Lymire edwardsi.* Pupa concealed, brown, normal.

Food plants.—Philibertia viminalis, *Vincetoxicum palustre.*

SCEPSIS FULVICOLLIS Hübner.

The larva of this common moth has been briefly described by Coquillett. The following life history was obtained from eggs from New York City, handed me by Mr. L. H. Joutel.

Egg.—Low conoidal, the base flat; more than hemispherical; shining pale yellow; surface very finely, nearly hexagonally, reticulate, the lines narrow; diameter, 0.7 mm. Laid in rows on a grass blade.

Stage I.—Head rounded, slightly bilobed, pale whitish, shading to brown on the apices of the lobes, a large, rounded, black spot on the face of each lobe and a much smaller one over ocelli; width, 0.4 mm. Body whitish, cervical shield brown, the tubercles and anal plate slaty black. Hair long, spinulose, black. Hairs all single, no subprimaries; on thorax ia, ib, and iia on a single wart, iib small, remote, posterior; on abdomen i smaller than ii, iv and v small, iv behind the spiracle, normal.

Stage II.—Head rounded, bilobed, full, pale transparent luteous, a large, black patch on the front of each lobe above; ocelli black, mouth dark brown; a narrow, dark line on vertical suture; width, 0.6 mm. Cervical shield small, transverse; warts i and iv single haired, the latter very small; ii, iii, and vi many haired, vi large; a group of hairs on the leg shield. Body translucent, faintly luteous, a broad, shaded brown, dorsal stripe, widening irregularly in the incisures, and a narrower, irregular, lateral shading forming broad rings about warts iii. Warts large, colorless, but with small black tubercles for each hair. Hairs black and pale, slightly spinulose, pointed, rather short. On joints 3 and 4 only one large subdorsal wart; tubercle v a large wart, but single haired.

Stage III.—Head rounded, slightly bilobed, shining sordid whitish, a black patch on the face of each lobe above, a small one over ocelli, and very small one in apex of clypeus; mouth brown; width, 0.75 mm. Body cylindrical, arctiiform, with distinct warts and normal feet. Scarcely any hair on joint 2, the hair of joints 3, 4, 12, and 13 much longer than on the rest of the body. Hair thin, fine, spinulose, black, paler subventrally. Body dorsally dull reddish, a darker dorsal line, a pale subdorsal one just below wart ii, and traces of a lateral one above iii; below iii, including the subventral region and feet, pale whitish, sharply marked from the dorsal color. Warts black, ii, iii, v, and vi large, i small, all many haired except i and v, which have only two or three hairs, iv a tiny rudiment behind the spiracle, just perceptible. Joint 2 much contracted, the cervical shield indistinct; joint 3 a little elevated above 2. Thoracic warts as before; iib quite visible.

Stage IV.—Head bilobed, full, shining pale luteous, a black spot on each lobe before, one in clypeus, a streak in the vertical suture, and ocelli narrowly black; mouth only slightly brown; width, 1.2 mm. Body nearly black, a faint, pale luteous subdorsal and subventral band, straight and even, the subventral the broader, both obscure. Joint 2 much contracted, the long hairs of 3 overhanging the head. Other hair moderate, black and white. Warts large, arctiiform, many haired except iv, which is obsolete. Wart i large, smaller than ii; iii largest of all. Warts dark gray, with black hair-tubercles. All feet black.

Stage V.—Head full and rounded, scarcely at all bilobed, very pale luteous brown, the small clypeus and a transverse band adjoining it and nearly covering ocelli as well as vertical suture narrowly and posterior edge of occiput, black; labrum, antennæ, and mouth pale; width, 1.8 mm. Body black, venter gray, as also joint 2, which is nearly without hairs except subventrally; cervical shield shining, small. Lines all obsolete, subventral fold a little pale; throracic feet partly black, abdominal ones pale. Warts large, black; hairs black and white, moderate, a group of longer ones overhanging the head. Another had the head pale, a tiny brown spot on the face of each lobe and apex of clypeus; the two groups of ocelli narrowly black and a line in the vertical suture. The warts are large, except iv, which is a nearly hairless rudiment. Later black, subdorsal line faintly traceable, pale brownish, subventral line whitish in a broad pale gray area that extends from wart iv to venter. As the body pales further with growth, a dark dorsal line appears and shades below the subdorsal and above the subventral stripes.

Stage VI.—Head round, full, rather large, not bilobed; clypeus small, shining reddish luteous, marked with black as before; paraclypeal pieces pale; width 2.6 mm. Body arctiiform, joint 2 contracted; warts large, low, black, iv obsolete. Dorsum dark gray, with shaded black dorsal line; subdorsal line distinct, bright orange shaded, especially posteriorly on the segments, sides black; substigmatal line pale yellow, a little transversely streaked, like the subdorsal one; venter gray; feet very pale. The long hairs of joints 3 and 4 (from the large warts ia+ib+iia and iv+v) and joints 12 (from wart ii) and 13 (from warts i, ii, and anal plate warts) are black; those from the rest of the body paler, from i to iii slightly penciled;

subventral hairs diffusely spreading. On thorax warts iib and iii are present as single hairs. Warts all surrounded by whitish rings. Joint 2 is so shrunk up as to be concealed; no hairs arising from it.

Cocoon spun on the cover of the jar, very thin, mostly of hair, the pupa visible; a tuft of hair in front, as in *Lymire edwardsi.*

Pupa.—Cylindrical, slightly tapering, head prominent, the thorax sloping; flesh colored, nearly white; traces of the reddish subdorsal line of the larva and rather numerous black marks in double segmental, subdorsal, and stigmatal spots and ventral stripe reaching over cases and all, and the edges of cases, especially the costa of fore wings. Eggs hatched September 15, imago October 19. The species seems to breed continuously until stopped by the cold, unlike *Ctnucha virginica*, which has a definite hibernating period and is single brooded.

Food plants.—Species of grass.

CISTHENE SUBJECTA Walker.

Cisthene subjecta Walker, Cat. Brit. Mus., II, 1854, p. 534.—Stretch, Zyg. Bomb. N. A., 1872, p. 155.—Neumoegen and Dyar, Journ. N. Y. Ent. Soc., I, 1893, p. 115.

Hypoprepia packardii Grote, Proc. Ent. Soc. Phil., II, 1863, p. 31.—Murtfeldt, Psyche, III, 1881, p. 243.

Miss Murtfeldt has described the mature larva. She found three molts after hibernation. My larvæ reached stage V before hibernation, and so would probably not have had but one molt in the spring, perhaps not any. They failed, however, to pass the winter. The following, with Miss Murtfeldt's description of the mature form, will give the full life history of the little species.

The larva is somewhat anomalous. Like lichen feeders in general, the warts are practically single haired. This reduction, affecting the wart characters of the Lithosiidæ, is interesting, though it naturally tends to somewhat confuse the phylogenetic arrangement characteristic of the family. However, we see tubercles ia and ib of the thorax still in line anterio-posteriorly, which seems to be the essential point, although they do not become multiple haired and are somewhat crowded together.

Egg.—Rounded conoidal, the base flat and concave centrally, not quite so wide as the egg itself; surface polyhedral, the cell areas flattened, rounded hexagonal, reticulations scarcely raised, rather small, surface slightly shagreened; diameter 0.7 mm. The eggs are laid in a line, separated from each other and each tipped at an angle so that they rest on only one corner of the base. This gives it, at first sight, the appearance of having an odd, unusual shape.

Stage I.—Head rounded, bilobed, clypeus moderately high; colorless, transparent, a black patch on the face of each lobe above, another over ocelli; labrum black; vertex faintly brown shaded; width, 0.3 mm. Body cylindrical, arctiiform, segments well marked; feet normal, with slender, club-shaped, protuded planta bearing few crochets; colorless, transparent, glassy. Tubercles small, conic, concolorous; shields obscure, not colored. Hairs of various lengths, spinulose, arctiiform, the strong-ones dark brown, the weak ones colorless. Hairs of joint 2 small. On thorax, warts ia and ib in line anterio-posteriorly, iib weak; hairs all single, no subprimaries. On abdomen i absent on joints 5 to 9, a trace on joint 10, a small seta on joints 11 and 12; ii and iii distinct, iv behind the spiracle, v subventral; ii and iii of joints 12 and 13 are very long, six times the width of the body or more. Head setæ rather short, pale, spinulose. Ocelli six, in a rectangle.

Stage II.—Head rounded, bilobed, mouth squarely produced; translucent, whitish; labrum, spot below vertex of each lobe, back part of the side, and a spot covering the eyes black; width, 0.4 mm. Body squarish, a little flattened, whitish, translucent, all the dorsum appearing grayish from the food. Legs slender, normal. Warts rather large, pale; i a single hair curved forward, ii single, curved backward; iii with two hairs, iv and v single, vi with two hairs; leg shield with short hairs. On thorax ia, ib, and iia gathered together a little, but not on a true wart; iii, iv, and v likewise approximate. The thoracic hairs are almost exactly as in stage i, except for the addition of setæ iii and v. Hairs dusky, the ones at the ends long. Anal plate and cervical shield reddish; also paired spots of this color on joint 5 over tubercle ii and on joint 9 over i.

Stage III.—Head rounded, full above, scarcely bilobed, not higher than joint 2; translucent, whitish, shining, a black patch on vertex of each lobe, one on face of lobe above, over ocelli, and on jaws; a dark shade in vertical suture; width, 0.55 mm. Body rather flattened; feet large, spreading; translucent, whitish; a faint, broken, white dorsal, subdorsal, and subventral stripe and a row of subdorsal brown-gray spots on tubercle iii, with a large reddish one on joint 5, very faintly also on joint 11; the subdorsal spot of joint 12 large. Warts concolorous, hairs pale, fine; setæ i and ii single, short, black, spinulose; iii with two hairs, one of them long; iv and v single, pale; vi with two hairs, pale. Hairs all as before on the thorax. The dorsal white stripe is composed of a series of squarish patches on the segments posteriorly; the others are narrower, broken lines. Joint 12 slightly enlarged. Cervical shield, anal plate, and a series of ventral patches obscurely gray-brown. Later the dorsum is greenish, the patch on joint 9 large, single, dorsal, the whole larva closely resembling bark. Length at end of stage, 5.5 mm.

Stage IV.—Head rounded, slightly bilobed, the clypeus two-thirds its height; labrum quadrate, large; ocelli distinctly projecting; translucent whitish; a large black patch on the face of each lobe, irregularly shaped, running back to the occiput; a rounded patch over eyes;

black triangular mottlings in the vertical suture; jaws black; setæ pale, rather long; width, 0.8 mm. Body flattened, thorax a little largest, joint 2 distinct and as large as the others, joint 13 rather small; translucent gray, finely black dotted, a white dorsal band, composed of intrasegmental blotches, each of three transverse, confluent streaks, distinct only on joints 5 to 11; a waved, black lateral line forming three strong segmental loops on the thorax, then at joint 5 running high and covering tubercle ii, on joints 6 to 10 forming a series of oblique lines from before subdorsally to behind subventrally, on joints 11 to 13 confused blotches. A series of black streaks below wart v. Warts i, ii, v, and vi dull orange. Pale yellow, black edged dots most distinct dorsally on the thorax and on joint 12 and laterally below the black band. Hairs sparse, moderate; blackish dorsally and pale subventrally. Warts iii and vi two-haired, the rest single. Thorax as before.

Stage V.—Head round, wider than high, very full in front, the clypeus not depressed, high; labrum projecting; marked as before, but the clypeus all pale; width 1.15 mm. Body exactly as before. On the thorax the white dorsal line is nearly obsolete and the subdorsal black line is more lateral than on the body, making the dorsal space broadly pale; it looks depressed (though not really so) and different from the rest of the larva. Feet pale. The arrangement of the thoracic warts is: ia and ib closely approximate, in line anterio-posteriorly; iia below, separate; iib small, remote, posterior; iii distinct, posterior; iv and v closely approximate, anterior; vi subventral, all single-haired.

Food plant.—The scurfy bark and tiny lichens growing on the stems of oak trees. Larvæ from Bellport, Long Island, New York. Eggs August 9. Larvæ hibernating October 15.

CALIDOTA STRIGOSA Walker.

Arctia strigosa Walker, Cat. Brit. Mus., III, 1855, p. 615.

Halisidota strigosa Walker, Cat. Brit. Mus., III, 1855, p. 736.—Möschler, Abh. Senck. Ges., XIV, 1886, p. 34.—Neumoegen and Dyar, Journ. N. Y. Ent. Soc., I, 1893, p. 168.

Halisidota cubensis Grote, Proc. Ent. Soc. Phil., V, 1865, p. 243.

Halisidota laqueata Hy. Edwards, Ent. Amer., II, 1887, p. 166.—Smith, List Lep. Bor. Am., p. 27, 1891, no. 1144.

Theages strigosa Kirby, Cat. Lep. Het., I, 1892, p. 202.—Dyar, Can. Ent., XXIX, 1897, p. 217.

I have placed this species in Theages Walker, following Kirby; but Hampson has shown that Theages is a synonym of Eucereon. Therefore a new generic term seems required for this moth, which I propose as above. The genus has been limited by me[1] as Theages. It differs from Halisidota by the presence of the accessory cell.

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[1] Canadian Entomologist., XXIX, 1897, p. 216.

The larva occurred to me at Palm Beach, Florida. It is a true Arctian, resembling Halisidota, but lacking the hair pencils. It persistently hides by day in leaves, apparently on the ground near its tree, and is consequently difficult to find.

Stage I.—Head round, slightly bilobed; lobes full; clypeus moderate; pale brown, shining, mouth blackish; width, 0.6 mm. Body ochraceous, orange brown in the incisures; a broad white dorsal stripe on joints 5 to 10, edged by a subdorsal brown stripe that occupies all of the dorsum of joint 11; joints 3 and 4 dorsally pinkish brown. No cervical shield nor anal plate; setæ in groups of five subdorsally on joint 2. Legs normal, arctiiform; shields elongate, dusky; tubercles colorless, i to iii of joint 5 black, iii to vi of joints 5 to 11 dusky. On thorax ia+ib, iia separate, iib weak, remote, posterior, vi 2-haired, iii and v absent. On abdomen iv behind the spiracle, vi present, elongate, without hairs. Hairs black, spinulose, ib of joints 3 and 4, iii of 12, and the subventral ones white.

A still younger larva was diffusely whitish lead color centrally on joints 6 to 10, orange at the ends, all the tubercles dusky blackish.

Stage II.—Head rounded, bilobed, full; clypeus moderate; testaceous brown, shining; ocelli black; width, 0.9 mm. Joint 2 retracted and with lateral warts only; joints 3 and 4 large, with long hair overhanging the head; two warts above the stigmatal wart, the upper one the larger. On the abdomen warts i to vi present, about alike, moderate, wart i a trace smaller, iv stigmatally posterior. Joints 2 to 4 and 12 to 13 orange, 12 the lightest; dorsum of joints 5 and 11 dull vinous; dorsum of joints 6 to 10 and subventral region (tubercle iv to the feet) opaquely whitish. Thoracic and anal feet orange tinted; abdominal ones of joints 7 to 10 pale, with concolorous shields. Warts black; hair black dorsally, white subventrally, not very abundant, longer at the ends. Later all vinous except joint 12, joints 2 to 4 lighter than the central part; subventer whitish, the white stripe reduced to dots along wart v.

Stage III.—Head rounded, orange testaceous, ocelli black, four in a semicircle, two below; jaws brown, mouth area pale; width, 1.36 mm. Joint 2 much retracted, no cervical shield, as before. Dark vinous dorsally; subventer and feet pale, nearly colorless. Joint 2 dorsally luteous; 3 dark reddish orange; 6 to 10 white in a broad dorsal area reaching wart ii; 12 orange, 13 paler except a narrow purplish dorsal band on joints 12 and 13. Warts colorless; anal feet pale, extended. Hair abundant, black and white mixed, spinulose, longest at the ends. The black hairs are slightly more pointed dorsally on joints 5 and 12, but not forming tufts. A white stigmatal line on joints 5 to 11. The larva looks purple, marked with white; the head, joints 4 and 12 red.

Stage IV.—Head shining dark red brown, a little blackish lined about the sutures, epistoma white; width 2.1 mm. Body as before, the dorsum of joints 6 to 10 broadly gray white, cut by a slender dusky dorsal line; joints 4 and 12, except dorsally on joint 12, dull orange. All the rest blackish purple with narrow white line on the subventral fold; feet and venter pale, nearly colorless. A short black tuft from the upper side of wart ii on joints 5 and 12, forming a paired tuft on joint 5, single on joint 12. Other hair moderately dense, not concealing the body, fine, sordid reddish and blackish mixed, with some long white ones at the ends. The general tint of the hair is a reddish brown. Warts pale, slightly flesh-colored, moderate, round. With growth the color becomes more sordid, the white suffused with dull red, the dark purple parts lighter and more purplish, only joint 5 remaining dark. Warts surrounded by white rings; feet reddish.

Stage V.—Head broad, not high, full and round, scarcely bilobed; clypeus reaching nearly to the top of the front; shining black, epistoma narrowly and the base of antennæ white; width 2.5 mm. Body sordid gray; subdorsally on joints 6 to 10 and 12, the ground color is lighter and pale salmon tinted; warts all pale salmon color. Hair rather uniform, moderately dense, reddish, much the color of dead leaves, but lighter and somewhat salmon colored like the warts. The long hairs anteriorly and posteriorly are whitish. A narrow whitish stripe along the stigmatal fold of joints 5 to 12. Feet pale, slightly reddish. Warts large, round, i, iv, and v a trifle smaller, all well alternating, arctiiform. Joint 2 much retracted, with slight warts; two subdorsal warts on joints 3 and 4, ib and iii present as distinct rudiments. Hair spinulose, sharp pointed. No tufts, the dorsal hair not even keeled. Spiracles black rimmed. Later the larva is uniformly sordid grayish with a dusky dorsal line, the hair pinkish brown, slightly darker dorsally on joints 5 and 12. White substigmatal band obsolete except intersegmentally.

Stage VI.—Head shining black, basal joint of antennæ reddish, epistoma slightly paler at the sides, mostly black; width 4 mm. Body fleshy brown with a vascular dorsal blackish stripe; warts and hair light pinkish brown. Hair regular, dense, with numerous longer concolorous ones at the ends. White subventral band (above wart v) present in the incisures only, obscure. Feet reddish. The hair is densely spinulose; seen at right angles it is pale pinkish brown; seen obliquely it is much darker and more reddish brown.

Cocoon elliptical, rather thin, composed of hair and silk, spun among leaves, not entirely concealing the pupa.

Pupa dark mahogany brown, shaped as in Halisidota.

Food plant.—*Guettarda elliptica.*

INGURA BURSERÆ Dyar.

Stage I.—Head greenish luteous, ocelli black, mouth brown; width, 0.3 mm. Body thickest anteriorly, feet normal; translucent yellow, green tinted. Tubercles small, all neatly black, i to v present; no shields, the leg plates dusky.

Stage II.—Head 0.5 mm. Green, no marks, four black tubercles on the cervical shield. Shape as in the next stage. Tubercles obsolete, setæ pale, short. Skin translucent, the dorsal vessel showing darker.

Stage III.—Head slightly squarish, bilobed, green, the jaws brown; clypeus reaching about half way to vertex; width, 0.8 mm. Body cylindrical, thickest in front on joints 2 to 5, tapering posteriorly, especially on joint 13. Feet normal, the anal pair divergent. Green, a yellow subdorsal line on joints 5 to 13 anteriorly. Shields not cornified; four black tubercles on the anterior edge of the cervical shield; all else colorless; tubercle iv substigmatal posteriorly; setæ pale.

Stage IV.—Head as before, ocelli black, clypeus reaching less than half way to vertex; width, 1.3 mm., small in proportion to the body. Green, the food showing darker; subdorsal line yellow, on joints 3 to 13 anteriorly, with irregular yellow specks in front on joints 2 and 3. No shields, the black tubercles on the anterior edge of joint 2 are white edged. A yellow stigmatal line on joints 2 to 12. Feet normal, with long claspers.

Stage V.—Head rounded, soft green, the ocelli black, five in a semicircle and one below behind the antenna, the third the largest; jaws brown; width, 1.8 mm. Translucent green, the food darker; subdorsal line from joint 3 to anal plate, stigmatal from 2 to 12 anteriorly, narrow, yellow. Rather numerous, irregular yellow dots scattered over the body and on the anal feet. Spiracles reddish; tubercles small, concolorous, setæ pale. Six tubercles on the cervical shield, the two upper anterior ones black; no cornified shields. Tubercle iv below the spiracle on joints 7 to 10, in line with tubercle v on joint 11, below the spiracle on joint 12.

Stage VI.—Head 2.4 mm. As before, but the black dots on joint 2 are minute and inconspicuous. Yellow subdorsal and stigmatal lines distinct, the irregular spots numerous. Slight, dull, reddish, mottlings about tubercles iii and v.

Cocoon in the sand or between leaves on the ground, the leaves partly bitten up.

Food plant.—"Gumbo-limbo" (*Bursera gummifera*); larvæ from Palm Beach, Florida.

GONODONTA UNICA Neumoegen.

Egg.—Shape of two-thirds of a sphere; reticulations small, irregularly pentagonal, linear, pale; no ribs; diameter, 0.65 mm. Laid scatteringly over the leaves singly or in groups, numerously, a very large proportion being destroyed by parasitic Hymenoptera.

Stage II.—Head round and broad, thin, especially above, scarcely bilobed; sooty black, labrum narrowly white. Body cylindrical, thickened at joints 5 to 7 and 12, which is well humped, the sides of joints 6 and 7 folded and projecting; abdominal feet on joints 9, 10, and 13. Sooty black, joints 9 and 10 a little greenish, with black dorsal line; a pure white subdorsal fleck on joint 2; four lateral ones on joint 8, the two upper ones large and joined by a bar, the second centered by a black tubercle (iii); a bright orange, oblique, subdorsal spot on joints 5 and 6, and a rounded one on joint 12. Setæ short, black. Segments annulate near the incisures.

Stage III.—Head round, bilobed, sooty black, the labrum white; width, 1 mm. Body greatly hunched at joints 3 to 7, forming a rounded, thick loop, the bases of feet of joint 4 touching the venter of joint 8; joint 12 enlarged triangularly. Abdominal feet short and small, none on joint 7, a small pair on 8, distinct feet on 9, 10, and 13. Purplish black, annulate, spotted with orange and white. The white spots are a large lateral one on joint 2, a small one on edge of cervical shield, a lateral patch on joint 8 in part; the orange spots are oblique subdorsals on joints 5 and 6, lateral patch on joint 8 in part, subventral spots on joints 8 to 10, and a rounded subdorsal spot on joint 12. Later fine transverse white lines appear between the obscure annulets.

Stage IV.—Head bilobed, free from the prothorax; sooty black, bases of antennæ and labrum whitish; clypeus not reaching half way to the vertex; width, 1.8 mm. Body cylindrical, nearly uniform, but well looped up at joints 5 to 8; joint 12 enlarged dorsally. Feet of joint 8 small, functionless, normal on 9, 10, and 13. Body marked in the pattern of the genus Alypia. Black, finely transversely lined with white, 15 to 20 lines per segment, some continuous, some confused and broken, subreticulate. Those below the slight subventral fold run longitudinally and are more reticulate; cervical shield obsolete, concolorous, a white spot on each side. Subdorsal orange spots, partly white bordered, on joints 5, 6, 8, to 12; also small ones on 9 to 11. Similar spots on the subventral fold on joints 7 to 12, largest on joints 8 to 10. Anal flap and bases of feet concolorous, white reticulate. Thoracic feet black.

Stage V.—Head rounded bilobed, full, clypeus shield-shaped, reaching less than half way to vertex; width, 2.7 mm.; sooty black, epistoma white. Body as before, the cervical shield black, white-lined, with dorsal, subdorsal, and lateral large white spots. Body black, finely white lined as before. Subdorsal and subventral spots creamy orange, white edged, the subdorsal ones on joints 5, 6, 8 to 12, the subventral ones on joints 6 to 13. Thoracic feet black.

Cocoon composed of large pieces of leaf, bitten off by the larva and united by silk, the ends roughly projecting, resembling a nest of a leaf-cutting bee.

Food plant.—Anona laurifolia. Larvæ from Palm Beach, Florida.

PERIDROMA INCIVIS Guenée.

I have given the life history of this species previously[1] from notes made ten years ago; but the present notes contain so many additional points that I have concluded to reproduce them. The later larvæ passed one more molt than the former, the former omitting the normal Stage II, as appears from the measurements. The width of head for Stage I, as given in my first description, should be corrected to 0.3 mm.

Egg.—Spheroidal, the base flattened; about 40 vertical ribs, diminishing alternately in number to about 15 about the vertex, which is coarsely reticulate; cross striæ distinct lines; dark purplish when found; diameter, 0.6 mm. The eggs were laid in a large mass on the leaf of a tree; the larvæ fed on the grass beneath.

Stage I.—Head rounded, bilobed, clypeus two-thirds to vertex; sordid luteus with brown flecks; ocelli black; width 0.3 mm. Cervical shield nearly semicircular, brown dotted, cornified, bisected by a broad, pale, dorsal line; anal plate small, smoky. Thoracic feet black; abdominal on joints 7 to 10 and 13 with smoky shields, the feet of joints 7 and 8 small. Body cylindrical, joint 12 a little enlarged; colorless, food green; tubercles small, round, black. Faint subdorsal (i and ii), lateral, broader stigmatal (iii and iv) and subventral broken brown lines. Tubercles normal, no subprimaries, iv behind the spiracle. On thorax tubercles i and ii separate.

Stage II.—Head rounded, bilobed, erect; whitish, faintly washed with brown, especially in two obscure, vertical bands; ocelli black; width 0.45 mm. Body green, four side stripes of purplish brown, a white substigmatal band between the last two, the subventral one somewhat broken. Dorsum rather broadly green; feet and venter pale; feet on joints 7 and 8 very short. Setae black; tubercles small and obscure. Joint 12 humped.

Stage III.—Head whitish, ocelli black, mouth brown; a faint brown band, curved, parallel to sutures, and one back from ocelli, below which are some distinct dark brown reticulations; width 0.6 mm. Green, uniform in size, joint 12 a little enlarged. Cervical shield faintly luteous, scarcely cornified. Dorsal line white, narrow; subdorsal, lateral, and stigmatal lines dark brown, with two white lines filling up the space between them; below a distinct white line on subventral fold; a brown subventral band over tubercle vi. Tubercles and setæ small, black. Leg shields dusky.

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[1] Canadian Entomologist, XXVI, p. 18.

Stage IV.—Head as before, width 0.8 mm. Body green, dorsal line white, green edged; subdorsal and lateral lines light brown; suprastigmatal broader, darker purplish brown; substigmatal white, broad; traces of a brown subventral band; no shields; tubercles and setae minute, black.

Stage V.—Green form. Head rounded, green, shining, a blackish line parallel to clypeus and sutures, one back from ocelli and a fainter one between over face of lobe, all somewhat reticulate. Width 1.3 mm. Body noctuiform, joint 12 slightly enlarged, no shields, feet equal. Green, finely whitish and brown mottled. Geminate dorsal and four side lines below tubercle ii greenish black. Substigmatal band broad, red centered, reaching from joint 2 anteriorly to the anal foot, dark edged above. Feet pale. Tubercles and setae small, black.

Brown form.—The same, but the head luteous and the body brownish tinged; lines brown, not blackish green.

Stage VI.—Head luteous, the lines as before, blackish, reticulate; width 2.1 mm. Body brown, like dead grass, with a broad white sub stigmatal band from joint 2 to the anal foot, broadly filled in with red, slightly cut by the spiracles except on joints 2 and 12, where it passes below them. Skin marked with red-brown, faintly lined. Geminate dorsal and broken subdorsal black powderings appear as dorsal intersegmental and subdorsal segmental black specks; a double obscure brown lateral band. Subventer red mottled, dark brown shaded below the substigmatal band, which is sharp edged on both sides; feet pale. Cervical shield pale, trilineate with whitish; anal plate slightly greenish, otherwise like the body. Tubercle iv of joint 5 is at the middle of the spiracle, on joint 6 below the lower corner, on joints 7 to 10 below the middle, on joint 11 below the spiracle, on joint 12 above the middle. Leg shields transparent, with three black tubercles in a triangle.

Stage VII.—The same; width of head 2.7 mm. Substigmatal band broadly reddish centered, mottled, brown spotted, leaving a sharp-edged white line above and below. Other lines as before, a lighter, more yellowish brown space in the middle of the side. Spiracles white, black edged.

Pupa in the ground, light brown.

Food plant.—Grass (Cenchrus).

CAPNODES PUNCTIVENA Smith.

Egg.—Low domed, the base flat; circular from top view, one-third of a circle from the side. Reticulations distinct, finely linear, hexagonal, a little elongate vertically and seeming to be slightly arranged in vertical lines; a slight obsolescence at vertical micropyle. No ribs, but faintly indicated vertical groovings, a suggestion rather than any tangible structure, seen only in certain lights. Color translucent green. Diameter 1.2 mm., height 0.3 mm. (The egg was accidentally destroyed, so that there is a possibility of its being wrongly determined.)

Stage III.—Head round and full, the sutures obscure, free from joint 2; mouth not projecting; pale green, ocelli black, tubercles brown, making it look speckled; mouth brownish; width 0.6 mm. Body slender, the incisures well marked, anal feet stretched out posteriorly. Abdominal feet on joints 7 to 10, very small on 7, small on 8, normal on 9 and 10. Pale green, smooth, translucent, incisures a little shining, tubercles small, brown, i and iii the largest, iv substigmatal posteriorly. Setæ long, dusky, rather coarse. No shields, the corresponding tubercles brown as on the body. Tubercle vi pale, without brown coloration.

Stage IV.—Head slightly bilobed; ocelli black, four above in a curved row, two below in line posteriorly with the antennæ; clypeus reaching half way to vertex; width 0.8 mm. Pale green, tubercles brown, setæ black. Body as before, the tubercles brown, ib of thorax and ii of abdomen in a large spot, the others small.

Stage V.—Head 1.4 mm. Soft green, tubercles all roundedly red brown, ii large. Body slender, feet of joint 7 somewhat small. Tubercle iv fully to the middle of the spiracle on joint 5, below the spiracle on 6, becoming higher posteriorly, at 10 nearly opposite the middle, on 11 lower but only substigmatal, on 12 below the lower corner. Setæ long, dark dorsally, pale subventrally. A faint broken reddish lateral line below tubercle ii.

Stage VI.—The same; head 1.8 mm. The reddish lateral line is faint and broken, with some similar spots below, irregular, avoiding the tubercles. The merest trace of a similar narrow subdorsal line along tubercles i and ii. Otherwise no change from the previous stage, green, the tubercles brown. The color is soft and translucent, but the food not visible, not shining.

Stage VII.—Head 2.2 mm. Green, the tubercles on head and body brownish red; traces of a broken subdorsal (tubercles i and ii), lateral, suprastigmatal (iii) lines and very faint subventral mottlings. Spiracle of joint 12 three times as large as the others. Tubercle iv below the lower corner of spiracle as before. Claspers of feet very large, the anal feet divergent. Rather slender and a little flattened, narrower posteriorly. Setæ distinct, black.

Pupa in a slight web in the ground.

Food plant a species of Eugenia, probably *E. buxifolia.* Larva from Palm Beach, Florida.

REMIGIA LATIPES Guenée.

The mature larva has been briefly described by Mrs. Swainson,[1] who mentions the peculiar habit it has of folding itself up with the thoracic feet touching the abdominal ones of joints 9 and 10 and an angle in the body at joint 5. The larva feeds at night, living concealed in the grass.

Egg.—Spheroidal, very slightly flattened above and below, symmetrical; about 24 low, sharp, vertical ribs, not diminishing in number till toward vertex, where all end; cross lines fine and obscure, those with the vertical reticulations invisible to the lens, but seen under a half-inch objective. Diameter 0.7 mm. Slightly greenish-gray, not shining. Later a vertical dull-red blotch and irregular lateral ring.

Stage I.—Head bilobed, rounded, full, free from joint 2, clypeus small; shining testaceous, brown tinted; ocelli black; width 0.3 mm. Body slender, thread-like; feet on joints 9, 10, and 13. Colorless transparent, food green; shields all concolorous and inconspicuous. Tubercles small, round, black. A subdorsal (over tubercles i and ii), lateral (above iii) and stigmatal (tubercle iv), faintly brown lines. Central segments long drawn out, the tubercles remote. Thoracic segments and joints 9 to 13 normal, not elongate. Cervical shield with two detached setæ on the posterior corners, four on the shield; greenish, concolorous. Head setæ normal, clypeal and paraclypeal ones small. Anal feet directed posteriorly, blackish outwardly. Tubercle i of joint 11 very small, the segment therefore weak. Other tubercles normal, i and ii in line, iv behind the spiracle; on thorax ia and ib approximate, iia and iib remote, iv anterior; no subprimaries. Later the narrow brown lines are more distinct, covering joints 2 to 13 with a line on the anal foot.

Stage II.—Head round, bilobed, full, cheeks below squarish, clypeus reaching above middle of front; whitish, green tinted, four vertical brown stripes on each lobe; the two next median suture join above, diverge below, one to the jaw, the other to antenna; this joins the third at antenna, which then runs to back of head laterally. The fourth, on lower edge of cheek behind ocelli, is double, the ends approximate, forming a pointed ellipse; width 0.5 mm. Body slender, uniform, a little flat; abdominal feet on joints 9, 10, and 13, the latter directed posteriorly. Three brown stripes on each side, reaching joints 2 and 13, the shields invisible and uncornified. The lines are subdorsal (over tubercles i and ii), lateral and stigmatal (covering iii and iv), with two fainter subventral lines on vi and vii, respectively, situated below the subventral fold and ventrally opposed. Tubercles small, black, well

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[1] Journ. N. Y. Ent. Soc., VIII, p. 33.

separated on the central segments, iv above the spiracle, nearly in line with iii. Setæ dusky, feet pale.

Stage III.—Head round, large, free from joint 2, slightly bilobed, clypeus rather small; whitish, with five nearly parallel brown bands on each lobe, continuous with the lines on the body. They are a little irregular and lighter brown in the center of each. Width 0.8 mm. Body slender but uniform, a little flattened ventrally; abdominal feet on joints 9, 10, and 13. Pale greenish yellow, with dark-brown lines about as wide as the intervening spaces. These are single, narrow, broken dorsal, double subdorsal, lateral, substigmatal, subventral, and pedal lines. The pairs are approximate, filled in between with yellowish brown, or might be called single lines, paler centrally. The pedal line is only obscurely geminate. Tubercles and setæ black, the former minute. Abdominal feet pale, brown spotted, the anal pair lined. Thoracic feet reddish.

Stage IV.—Head large for the body, round, full, scarcely bilobed; white, with geminate, brown, pale-brown filled lines as before, the central white space over the suture the widest. Abdominal feet as before, lines the same; also a single medio-ventral line. A geminate blackish dot in the subdorsal band in the incisure 5 to 6. The single dorsal line is nearly obsolete.

Stage V.—Head rounded, full, very large, one and a half times as wide as the body, projecting well above joint 2, smooth, not bilobed; pale yellowish, with many brown lines reaching from the mouth to occiput, parallel, curved, eleven on each side, obscurely in pairs; clypeus pale, as also the median suture somewhat broadly, and antennæ; width 1.5 mm. Body slender; no feet on joints 7 and 8; pale yellow, finely lined with brown; three lines and a broader median one below the subventral fold; fold yellowish, eight lines above it, namely, geminate dorsal, three subdorsal, united by a dark shade into a broad subdorsal band, double lateral, and double superstigmatal. The substigmatal pale interval is the subventral fold, and is yellower than the rest. No shields nor plates; legs brown lined. Black dots in the incisure 5 to 6; tubercles obsolete; setæ rather large.

Stage VI.—No change. The antennæ are long, twice the length of the mouth. The head is large, making the larva club-shaped, joint 2 widening to meet it; width 2.2 to 2.5 mm. Lines very fine, brown, crinkly, some breaking down; dorsal line fine, geminate; subdorsal of four lines filled in with an olivaceous shade, black dotted in the incisure 5 to 6; double lateral, single superstigmatal, single stigmatal, single substigmatal lines; broad subventral of four lines filled in with brown like the subdorsal; dark-brown medio-ventral with three lines between it and the subventral line, alternating reddish and brown. All on a pale yellow field, a little whitish in the dorsal space. Feet pale, brown spotted. Spiracles black ringed. Tubercles black, minute; setæ rather long.

Stage VII.—Head subspherical, large, a little elongate, thick, and free from joint 2, not bilobed; clypeus low, narrowly triangular; fifth ocellus close below antenna, large. Broadly white over clypeus and median suture, this color a little more than covering the paraclypeal pieces and reaching the antennæ, with a faint, double, reddish line in the clypeus and another on the paraclypeal suture. Sides whitish, with many mottled brown lines extending upward, parallel to each other, to the occiput, joining the lines on the body. There are about eighteen on each lobe, each obscurely geminate, mottled with pale dots; on the inner half of each lobe the lines are washed and connected by olivaceous. Clypeal and paraclypeal tubercles black, the others blackish ringed. Width 3 to 3.4 mm. Body slender, uniform; abdominal feet on joints 9, 10, and 13; smooth, nearly cylindrical. Yellowish white, with many brown or black geminate, mottled lines. Dorsal line red-brown, double, in a clear space of the ground color; subdorsal of six black lines with a large black patch in the incisure of joints 5 and 6; four lateral reddish lines; a nearly black suprastigmatal pair; a reddish stigmatal and substigmatal pair; six irregular and broken subventral lines, black, inclosed by a dark shade, forming a dark subventral band; next a reddish, then blackish, then two reddish, and finally a broader, nearly black, medio-ventral band. No shields; feet pale, marked with mottled lines. Spiracles black rimmed. Tubercles and setæ small, black; tubercle iv of joint 5 a little above the middle of the spiracle, on joints 6 to 10 between the middle and lower corner, on joint 11 opposite the lower edge, on joint 12 likewise, but the spiracle is one line higher than on joint 11. When disturbed, the larva curls up in a curious shape and is quiet, the black marks, ordinarily concealed in the incisure, exposed. Cocoon an elliptical silky net in grass.

Food plants.—Species of grass. My larvæ were fed on Cenchrus sp. Larvae from Palm Beach, Florida, from eggs laid by a captured female moth. The species seems to breed continuously.

CHYTOLITA MORBIDALIS Guenée.

The mature larva has been described by Mr. Coquillett.[1] His description coincides with my observations, but his statements about the habits are somewhat diverse. He gives as food plants certain fresh leaves, whereas my larvæ fed entirely on dead and dry oak leaves. However, after hibernation a few of them nibbled at grass and dandelion, so that it is probable that they may eat fresh leaves in the spring. The two dates given—April 1–May 5 and June 1–July 20—

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[1] Canadian Entomologist, XII., p. 44.

seem to imply two broods, but Mr. Coquillett tells me that this may mean only two larvæ, representing the dates at which they were found and spun, respectively. If so, both may have been hibernated examples, though the latter date is very late. My larvæ pupated immediately after hibernation, early in May. The species is single brooded both in my observations and by the dates given in Professor J. B. Smith's monograph of the Deltoids.

Egg.—Hemispherical, the edges a little rounded under, smooth, shining, regularly reticulate, the reticulations small and not conspicuous. Transparent, resembling water, a little yellowish, the yolk granules distinct and giving a somewhat opaque look. No ribs. Diameter, 0.6 mm. Laid singly on the backs of leaves of oaks and other trees, at some distance above the ground.

Stage I.—Little colorless semiloopers. Head slightly bilobed, colorless, mouth brown; ocelli black; width, 0.2 mm.; ocelli, 6; 4 in a semicircle above and a pair below. Setæ colorless, simple. Body whitish, colorless, shining, the feet on joints 7 and 8 a little smaller than those on 9 and 10; thoracic feet large. Setæ long, rather coarse, very minutely bulbous tipped, normal, the subprimaries absent. Tubercles conic, somewhat prominent, but concolorous and obscure. Part of the hairs curve forward. No shields visible. The larvæ ate the egg shells and afterwards dead leaves, refusing fresh ones. Each spun a fine web about itself. Later the tubercles appeared round, brownish black, small; head, cervical shield, and anal plate brown, slighly cornified. Body colorless, transparent.

Stage II.—Head about 0.4 mm., sordid brownish white, not shining, ocelli dark, setæ pale. Body slightly flattened, translucent, sordid white, joint 12 a little enlarged. Tubercles small, brown, normal. Feet of joints 7 and 8 small. Shields not cornified, concolorous with the body, their tubercles also brown. Feet pale. Segmental incisures slightly folded. Tubercle iv below the spiracle.

Stage III.—Head about 0.6 mm., round, pale yellowish brown, dotted reticulate with dark brown. Body dark sordid yellowish brown, finely dotted reticulate with red brown, forming faintly a dorsal line and leaving spaces around the small blackish tubercles. Shields not cornified, feet equal, setæ pale and small.

Stage IV.—Head 1 mm., pale brown, smoky, very obscurely finely reticulate. Body all leaf brown, a yellow ground finely reticulate with dark red brown, uniformly and neatly, the only mark a faint brown dorsal line. Tubercles small, black, setæ inconspicuous, vi and vii white and coarser than the others. Another brood were similar, but rather heavily smoky, obscuring the markings.

Stage V.—Head about 1.4 mm., pale brown, finely dotted reticulate, an inverted V mark above the clypeus and a vertical mark, forming indistinct lines. Body somewhat flattened by being retracted in the subventral region, the shields not cornified. Marks as before. The reticulations on the sides indicate a waved subdorsal line. The larva sits among the dead leaves on the ground, sluggish, covered by a soft web.

Stage VI.—Head 1.55 mm., small, rounded, pale brown, faintly reticulate with dark red brown; ocelli black; setæ short, pale, from small black tubercles. Body narrow at joint 2, otherwise thick and robust, flattened ventrally, feet short, joint 13 small. Pale brown, marbled reticulate with dark red brown, an obscure and partly broken dorsal line of reticulations. Tubercles and spiracles black, tubercle iv of joints 5 to 8 below the spiracle, of 9 and 10 opposite the lower angle, of 11 nearly in line with tubercle v, only a little above it, of 12 below the lower angle of the spiracle. Shields scarcely cornified, the anal plate more so than the cervical shield, both nearly unmarked and more luteous than the body, but not contrasting. Setæ obsolete except subventrally.

Stage VII.—Head 1.8 mm. As in the former stage exactly.

Stage VIII.—Head 2.1 mm., rounded, not bilobed, pale dull ocher, neatly reticulate with red brown, paler on the vertex, the clypeal sutures and ocelli darker. Body yellow, ochraceous, reticulate with red; a dorsal red brown line not crossing the cervical shield or anal plate, diffuse, but narrow and distinct. An irregular waved lateral line, caused by the reticulations being darker brown, in an arc of which tubercle iii is the approximate center on each segment. Tubercles distinct, luteous black, setæ obsolete, except subventrally. Spiracles black; shields and plate not cornified, colored like the body, but not distinctly reticulate, their tubercles luteous brown. Body moderately robust, a little flattened ventrally, of equal width, not tapering. Feet equal, short.

Eggs from Bellport, New York, laid June 12, hatched June 17; last larval molt September 15, with hibernation in the last stage; pupation May 1.

The number of stages is probably subject to some variation. Some of the full-grown larvæ after hibernation had the width of head only 1.8 mm., but they did not molt again, pupating in this stage.

RENIA SOBRIALIS Walker.

Eggs were obtained from moths of *Renia larvalis* early in June, and moths of *R. sobrialis* emerged in August. The two so-called species are thus seen to be seasonal forms of one, as suggested by Prof. John B. Smith in his monograph of the Deltoids.[1] The specimens were from Washington, D. C., and the larvæ fed on dry leaves, lying concealed under them, but not forming a web, as *Chytolita morbidalis* does.

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[1] Bull. 48, U. S. Nat. Museum, p. 72.

Egg.—Shape of two-thirds of a sphere, base flat but rounded under, neatly regularly reticulate, the reticulations well raised, irregularly hexagonal, elongated vertically, a little clearer than the egg itself, about alike all over; no ribs. Color white like ground glass. Later with irregular brown spots, more or less in a ring. Diameter .6 mm., height .4 mm.

Stage I.—Head moderate, rounded, bilobed, free, held vertically, pale luteous brownish, translucent, the rim and the sutures darker, ocelli black; clypeus two-thirds to vertex; width .3 mm. Cervical shield gray, darker than the head; anal plate paler, gray before, darker posteriorly. Body ground-glass white, tubercles normal, distinct, large, black. Thoracic feet and leg shields grayish. Feet of joint 7 very small, those of 8 larger, only those of 9, 10, and 13 functional. Setæ dusky, distinct, moderate, equal. Shape cylindrical, moderate or rather robust, joint 12 very slightly enlarged.

Stage II.—Head slightly bilobed, erect, vertex notched behind by the membranous triangle; smoky brown, setæ pale; width about .35 mm. Body transparent, shaded and spotted with vinous, dark, almost blackish from the food. Tubercles elevated, brownish; setæ short, pale. Slightly flattened ventrally, joint 12 somewhat enlarged dorsally. Cervical shield brownish, widely bisected, obscure. Thoracic feet dusky, abdominal ones pale, the pair of joint 7 short.

Stage III.—Head pale brownish, slightly vertically darker streaked, setæ pale, ocelli dark; width about .45 mm. Body as before, more opaque, the vinous shading dull, forming traces of a dorsal line. Body short and rather robust; tubercles brownish, moderate, a little elevated; setæ pale, glandular tipped.

Stage IV.—Head as before; width .6 mm. Body thick, slightly flattened ventrally, largest posteriorly, especially at joint 12, incisures distinct, segments subannulate. Cervical shield brownish, bisected, notched on the posterior lower corner, anal plate obscure. Whitish, washed and obscurely spotted with vinous, especially broadly on the dorsum. Food dark. Tubercles rather large, elevated, circular, brownish; setæ pale, glandular, iv behind the spiracle and larger than it, on joint 11 down in line with tubercle v. Thoracic feet smoky shaded; abdominal ones pale, all functional, those of joints 7 and 8 only a trace smaller.

Stage V.—Head rounded, erect, pale brown, mottled and clouded with darker; setæ coarse, short, pale brownish; width .8 mm. Body robust, joint 12 scarcely enlarged, a little flattened ventrally. Blackish gray in appearance, with a series of lateral quadrate yellowish patches anteriorly on the central segments. Skin sordid translucent, heavily blackish shaded over the dorsum to spiracles, the yellowish patches below and behind tubercle i on joints 6 to 11. Subventer mottled with dull brown, avoiding the tubercles. Tubercles moderate, blackish; setæ short, coarse, pale brownish, contrasting, i and iii bent forward, ii backward, all glandular tipped. Feet normal short; shields concolorous. Spiracles blackish. Another was nearly black, distinctly flattened ventrally, joint 12 slightly enlarged; head paler, contrasting. No conspicuous marks.

Stage VI.—Head round, not bilobed, but the vertical triangle distinct; erect, lower than and free from joint 2; coarsely shagreened; pale brown with large mottled confluent patches of dark brown, sordid; width 1.4 mm. Body flattened ventrally, robust and thick, joint 12 somewhat enlarged; segments irregularly 4-annulate. Tubercles large, roundedly elevated but dull, not shining, nearly concolorous with the body, black with pale circles at the base. Setæ pale, club-shaped, thick, directed forward and backward. Velvety brown-black, a pale dash below and behind tubercle ii on the two posterior annulent or a continuous pale subdorsal band. Cervical shield with pale mesial line and pale mottlings behind. Feet short, somewhat pale. Venter pale grayish. All the marks obscure. The larvæ look the color of dead bark, nearly black, though some are lighter, brownish, and the color generally pales decidedly during the stage, being darkest soon after the molt.

Pupa in a slight cocoon in dirt, shining, light brown.

TEPHROCLYSTIS NEBULOSA Hulst.

One of the bred specimens was named as above by the Rev. Dr. Hulst.

Stage I.—Head rounded, full, not bilobed, dark brown, sutures and ocelli darker; clypeus high; width 0.3 mm. Body moderate, pale yellow, smooth; cervical shield rectangular, anal plate and anal leg shields cornified; segments finely annulate; tubercles and setæ obscure; tubercles brownish, setæ with enlarged clear tips, short, pale.

Stage II.—Head rounded, vertex under joint 2, yellowish, brown shaded on the sides; width 0.4 mm. Body translucent sordid yellowish, a distinct brown dorsal stripe the whole length, and a shaded subventral band. Thoracic feet dark; anal shields dusky; cervical shield obscure. Setæ short, glandular, pale; tubercles small, brown. Later the marks fade and the body becomes all sordid luteous with pale brown dorsal stripe only. Shields weakly cornified, darker luteous.

Stage III.—Head rounded, slightly bilobed, pale brownish, eyes black; width 0.6 mm. Body moderate, rather robust, cylindrical, segments a little moniliform; not shining, pale fleshy yellow, a series of segmental, narrow, brown dorsal dashes. Traces of a subventral line on joints 5 and 6. Thoracic feet pale testaceous. Tubercles obsolete, setæ short, stiff, dark, with enlarged tips. Shields not cornified, concolorous, but not marked by lines.

Stage IV.—Head rounded, slightly bilobed, clypeus high; pale testaceous, eyes black, mouth brown; width 0.9 mm. Body smooth, moderate, minutely conically granular, setæ distinct, short, stiff, black with enlarged tips. Pale yellow, slightly green tinted, a narrow, brown, broken dorsal line, widening on joints 5 to 9 into arrow-shaped marks (the point anteriorly); a short subdorsal band on the thorax, and traces of a subventral band on the anterior half. Venter clear, subventral fold slightly whitish. Feet pale. Other examples have a faint or distinct brown dorsal and subdorsal lines, joining the arrow-shaped marks. On one example the marks were all large and a brown subventral shaded band was present, the brown color predominating over the yellow ground.

Pupa.—In a slight web; length 6.5 mm.; dull yellowish green, somewhat translucent, the rings of the abdomen luteous, the anal segment and cremaster brown; dorsal line dull green; sutures of cases finely lined in dark brown. The anal segment has a low rounded process laterally; cremaster slender, rather long, wide and flat, with a terminal row of long hooks. The shape is normal, much as in *Chlorochlamys chloroleucaria.*

Food plant.—Flowers of golden rod (Solidago sp.) from Bellport, Long Island, New York. A bouquet of these flowers was found alive with little Geometrids, consisting of the species here described, *C. chloroleucaria*, and *Deptalia insularia.*

STERICTA INCRUSTALIS Hulst.

One of the bred specimens was named by the Rev. Dr. Hulst. The larva is not uncommon in Southern Florida, solitary usually, in an inconspicuous web among the leaves of its food plant. The web is loose and open, suggesting a spider's web, but the larva lies concealed among the leaves. The moths have a curious habit of placing the eggs by preference in an old web of a former larva, where the leaves have not been too closely stripped. This usually happens where the former larva has been parasitized. There are probably six larval stages; I have not determined exactly.

Egg.—Flat, like a Cochlidian, singly or as many as six, laid overlapping like shingles. Elliptical, 1.8 by 1.2 mm.; surface neatly irregularly reticulate; dark ocher with a colorless rim, the shell white after the larva has emerged. Embryo visible, as in the Cochlidians.

Stage II (or I?).—In an old nest between two leaves stitched together. Head luteous, sutures and a faint line back from the ocelli brown; width about 0.4 mm. Body greenish, uniform, no shields, faintly brown lined to the subventral fold. (Incompletely observed.)

Stage IV.—Resting out straight in the center of a loose open web among the leaves. Head held out flat, flattened, clypeus rather high; face luteous, sutures brown, but on the sides of the lobes are three black lines with four alternating white ones from the mouth backward, continuing the lines on the body in the normal position of the head. A whitish vertical line parallel to the median suture; width about 0.8 mm. Thoracic feet large, black, pale ringed. Body slender, nearly cyclindrical; feet small normal. Segmental incisures not strongly marked. Venter dull green, dorsum lined with brown-black and white, the lines of both colors of equal width. Pale lines yellowish white except on the subventral fold, which is the last one and greenish. Brown lines are dorsal, subdorsal (tubercles i and ii), lateral, suprastigmatal (iii), and substigmatal. Tubercles small, black; setæ moderate, fine. Tubercles iv and v separate but approximate, v dorsad to iv and smaller, vi normal, vii of three setæ on the leg base. Two wavy brown subventral lines below tubercles iv+v and across vi, respectively. Subventer of thorax dark.

Stage V.—Head the same, but there are brown mottlings on the sides of the lobes above the black bars; width 1.5 mm. Body neatly lined with yellowish green and brownish black, as before, but the three lateral brown stripes are much wider than the pale intervals, which have become linear. The two brown lines below the substigmatal fold are present.

Stage VI.—Head rounded, the vertex under joint 2, the clypeus reaching two-thirds or more to the vertex; held out flat; lobes quite full; pale yellow, checkered with angular spots of very pale brown, also shaded with this color over the clypeus and along the median suture; ocelli white, black centered, surrounded by a black shade; mouth brown; antennæ moderate; tubercles minutely brownish; width 2.1 mm. Body slender, slightly flattened as before, lined. Dorsally three pale yellow lines alternating with two brown ones, becoming black and white on the cervical shield; subdorsally three broad dingy brown bands, alternating with two very narrow pale yellow ones; stigmatal line pale yellow, narrow, inclosing the white, black-rimmed spiracles; a yellowish line along tubercles iv+v with a faint brown one above; venter pale, nearly colorless. Tubercles small, black, i and ii in line or ii slightly dorsad, iv and v separate, iv directly below the spiracle, v a little dorsad and anterior, vi not much below iv, but well posterior, vii on the leg base of three setæ in a triangle. Shields perfectly concolorous, the anal plate and anal feet a little shaded with purplish. Crochets of feet in a whole circle. Later the ground color is whitish on the thorax, yellowish green centrally and shaded with brownish posteriorly.

The larvæ pupate in a slight web in the sand or between leaves on the ground. Pupa shining mahogany brown, thick and robust; cremaster sessile, with a tuft of long stout hooks.

Food plant.—*Nectandra willdenoviana;* also apparently the same larva on *Persea carolinensis.* Larvæ from Palm Beach, Florida.

SYNOPSIS OF THE FAMILY TELLINIDÆ AND OF THE NORTH AMERICAN SPECIES.

By William Healey Dall,
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In reviewing the family Tellinidæ, as restricted by me,[1] for the purpose of revising the American Tertiary species, so much work was necessitated on the recent forms of our coast as to make it desirable to record it for the benefit of students of the existing fauna.

The present synopsis aims to include in the list of North American species those which have been actually found on our coasts, exclusive of Central America and the West Indies, excepting a few which it seemed, for one reason or another, were likely to occur there, and do occur in adjacent waters, and have therefore been inserted. No attempt has been made to include a complete enumeration of the West Indian or Panamic Tellinidæ, though it is probable that a much larger number of them than is now known to do so will eventually be found to reach our waters. The energetic researches of Mrs. Oldroyd and other Californian collectors have already added a large number of molluscan species to the fauna of San Diego and San Pedro, which were previously recorded only from Mexico or Middle America, and it is to be anticipated that thorough dredging will add largely to the number. The northern limit of the Panamic fauna is Point Conception, California; its southern limit is probably in the vicinity of Payta, Peru, where the Peruvian current strikes westward across the Pacific.

Each coast boasts of over fifty species of Tellinidæ, the Pacific coast being slightly the richer, especially in the genus *Macoma*.

Pelecypods, being creatures living usually in moderate depths, are well suited to give indications of faunal relations as modified by geological changes. A table of the species common to both coasts, or represented by closely related analogues, will not be without interest.

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[1] Transactions of the Wagner Free Institute of Science, III, Pt. 3, 1895.

1. SUBTROPICAL SPECIES.

PACIFIC COAST.	ATLANTIC COAST.
Tellina cumingi.	*Tellina interrupta.*
Merisca reclusa.	*Merisca lintea.*
Merisca crystallina.	*Merisca crystallina.*
Elliptotellina pacifica.	*Elliptotellina americana.*
Eurytellina rubescens.	*Eurytellina angulosa.*
Moerella meropsis.	*Angulus promerus.*
Angulus macneilii.	*Angulus sybariticus.*
Angulus carpenteri.	*Angulus consobrinus.*
Angulus modestus.	*Angulus tener.*
Scissula virgo.	*Scissula exilis.*
Strigilla fucata.	*Strigilla carnaria.*
Strigilla cicercula.	*Strigilla pisiformis.*
Strigilla lenticula.	*Strigilla flexuosa.*
Tellidora burneti.	*Tellidora cristata.*
Metis alta.	*Metis intastriata.*
Macoma leptonoidea.	*Macoma leptonoidea.*
Cymatoica undulata.	*Cymatoica orientalis.*
Psammacoma panamensis.	*Psammacoma extenuata.*

2. BOREAL SPECIES.

PACIFIC COAST.	ATLANTIC COAST.
Macoma krausei.	*Macoma krausei var.?*
Macoma calcarea.	*Macoma calcarea.*
Macoma balthica.	*Macoma balthica.*

Table 1 shows that of the subtropical species eighteen are represented to some extent on both sides of the Isthmus of Panama and Middle America. Of these two, or perhaps three, are unchanged by their long separation, or about 17 per cent. If we adopt the geological percentages by which faunas are referred to subdivisions of the Tertiary, this proportion would indicate for our Tellinas a separation dating from some time in the Miocene, which is exactly what we learn from the geology of the Middle American region, where the last marine beds of any general extent, indicating a connection of the two oceans, belong to the Oligocene epoch, while the absence of marine Miocene from the whole of this region leads to the belief that the land surface was during that epoch above the sea.

I do not regard the evidence of the Tellinas alone as more than a trifle, but such as it is it coincides with other evidence of more weight. While some portions of Middle America may have been low enough to permit the passage of water between the two oceans since the Upper Oligocene, yet it is quite certain that this connection, if it existed, did not lead to any important interchange of animal life, nor prevent the northward migration of South and Middle American vertebrates and fresh-water mollusks into the continent of North America.

The boreal types tell another story, as they are practically common to the two oceans, as, indeed, is an overwhelming proportion of the whole Arctic and boreal fauna, though largely mixed toward the south with the fauna of the temperate regions, which is distinct.

As the Tellinas are mostly inhabitants of moderate depths, their distribution in latitude rarely affords anything remarkable. A few species, like *Macoma inflatula*, manage to extend their range over the northern border of the Panamic province by descending to considerable depths, where they find their normal temperature; and one species, found in shallow water on the Texas coast, by some remarkable chance still survives in deep water off the coast of California, though not known near shore. It may perhaps be a relic of the time when the cold northern current, passing through the Suwanee Strait (now the neck of the Floridian peninsula), carried a number of cold-water types to the northern shores of the Gulf of Mexico, where several of them have accommodated themselves to circumstances and still survive.

The full synonymy of the genera and of such species as were represented in the Tertiary or Pleistocene beds of North America will be found in the Transactions of the Wagner Institute, III, Pt. 5, now in press. For the convenience of students I add a list of references which will enable them to look up any of the species cited.

I may add that for want of time and material, in the synopsis of the group-names of the family, no attempt has been made to include the more or less problematical groups of the Mesozoic which are the precursors of *Tellina* and its allies.

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SYNOPSIS OF THE FAMILY TELLINIDÆ.

Genus TELLINA (Linnæus) Lamarck, 1799.

a. Hinge with two lateral laminæ in each valve.

Subgenus **Tellina** Lamarck, 1799. Type, *Tellina virgata* Linnæus. *Angulus* Megerle, 1811; *Tellinella* "Gray," Mörch, 1853, and *Eutellina* Fischer, 1887, are synonymous.

Section *Liotellina* Fischer, 1887. Type, *Tellina radiata* Linnæus. *Musculus* Mörch, 1853, not Rafinesque, 1818, is synonymous.

Section *Macaliopsis* Cossmann, 1886. Type, *Tellina barrandei* Deshayes. (Eocene.)

Arcopagiopsis Cossmann, 1886, is closely allied.

Section *Herouvalia* Cossmann, 1892. Type, *Herouvalia semitexta* Cossmann.

Section *Arcopagella* Meek, 1871. Type, *Arcopagella mactroides* Meek. (Cretaceous.)

Shell with the form and sculpture of *Moerella*, the sinus of *Arcopagia*, and the hinge of Tellina.

Subgenus **Linearia** Conrad, 1860. Type, *Linearia metastriata* Conrad. (Cretaceous.)

b. Hinge with two lateral laminæ in the right valve, the laminæ of the left valve more or less obsolete, or absent.

Subgenus **Elliptotellina** Cossmann, 1866. Type, *Tellina tellinella* Lamarck. (Eocene.)

Subgenus **Pseudarcopagia** Bertin, 1878. Type, *Tellina decussata* Lamarck.

Subgenus **Arcopagia** (Leach), 1827. Type, *Tellina crassa* Pennant.

Cydippe (Leach), 1852, not Eschscholtz, 1829; not *Arcopagia* Orbigny, 1853.

Section *Cyclotellina* Cossmann, 1886. Type, *Tellina lunulata* Deshayes. (Eocene.)

Section *Phyllodina* Dall, 1900. Type, *Tellina squamifera* Deshayes.

This has the form of *Phylloda* and the sinus of *Arcopagia*.

Section *Merisca* Dall, 1900. Type, *Tellina crystallina* Wood.

This group comprises more or less trigonal, usually rather convex shells of small or moderate size, with lamellose concentric sculpture and often fine radial lines in the interspaces. There is a narrow but sharp posterior flexure; the laterals of the right valve are strongly developed, but the left valve is without lateral teeth, its margin fitting above the laterals of the opposite valve. The pallial sinus is ample, frequently wholly confluent below and always largely confluent, the dorsal portion often represented only by a line connecting the adductors.

These shells are related to *Macaliopsis*, from which they differ in the absence of lateral teeth in the left valve; to *Moerella*, from which the sculpture and posterior fold separate them; and to *Pseudarcopagia*, which is not rostrate nor folded, while its radial sculpture is more conspicuous. The recent species are usually pale, without color markings, or white, and inhabit the warmer seas.

Section *Eurytellina* Fischer, 1887. Type, *Tellina punicea* Born.

Peronæoderma Mörch, 1853, not Poli, 1795.

Section *Scrobiculina* Dall, 1900. Type, *Scrobicularia viridotincta* Carpenter.

Shell tellinoid, thin; resilium short, strong, internal; hinge with feeble laterals; sinus confluent below.

Section *Quadrans* Bertin, 1878. Type, *Tellina gargadia* Linnæus.

Section *Tellinides* Lamarck, 1818. Type, *Tellina timorensis* Lamarck.

Subgenus **Phylloda** Schumacher, 1817. Type, *Tellina foliacea* Linnæus.

Subgenus **Moerella** Fischer, 1887. Type, *Tellina donacina* Linnæus.

Moera H. and A. Adams, 1856, not Leach, 1815; *Maera* H. and A. Adams, 1858, not Leach, 1813; *Donacilla* Gray, 1851, not Lamarck, 1812.

c. Hinge with a single strong right anterior lateral, closely adjacent to the cardinals, the other laterals absent.

Subgenus **Angulus** (Megerle em.), 1811. Type, *Tellina lanceolata* Linnæus.

Fabulina Gray, 1851, and *Tellinula* (sp.) auct., as of Chemnitz, are synonymous.

Section *Angulus* s. s.

Surface smooth or finely concentrically sculptured.

Section *Scissula* Dall, 1900. Type, *Tellina decora* Say.

Surface obliquely grooved.

Section *Oudardia* Monterosato, 1884. Type, *Tellina compressa* Brocchi.

With a thick internal anterior rib.

Section *Peronidia* Dall, 1900. Type, *Tellina albicans* Gmelin (*nitida* auct.).

Peronæa Mörch, 1853, not *Peronea* Curtis, 1824.

Subgenus **Omala** Schumacher, 1817. Type, *Tellina hyalina* Gmelin.

Homala Agassiz, 1848, not Mörch, 1853.

? Section *Homalina* Stoliczka, 1871. Type, *Tellina triangularis* Dillwyn.

Homala Mörch, 1853, not Agassiz, 1848?

Genus STRIGILLA Turton, 1822.

Type, *Tellina carnaria* Linnæus.

Strigella Gray, 1842; *Strigillina* Stoliczka, 1871, not Dunker, 1862; *Limicola* Fischer, 1887, not Koch, 1816, nor Leach, 1852; *Strigula* Pfeiffer, 1861.

Genus TELLIDORA (Mörch), 1856.

Type, *Tellina burneti* Broderip and Sowerby.

Genus METIS H. and A. Adams, 1856.

Type, *Tellina meyeri* Dunker.

Capsa Lamarck, 1799, not Humphrey, 1797; *Caspa* Bosc, 1802; *Lutricola* Carpenter, 1863, not Blainville, 1825.

Genus GASTRANA Schumacher, 1817.

Type, *Tellina fragilis* Linnæus.

Fragilia Deshayes, 1848; *Diodonta* Deshayes, 1846, not Schumacher, 1817.

Genus MACOMA Leach.

Subgenus **Macoma** Leach, 1819. Type, *Macoma tenera* Leach (= *Tellina calcarea* Gmelin).

Valves subtrigonal, rarely inflated, subequilateral, with a well-marked posterior flexure; sinus usually confluent below with the pallial line. Tertiary to recent in the cooler seas. *Macroma* Gray, 1825, and *Limicola* Leach, 1852, not Koch, 1816, are synonymous.

Section *Macalia* H. Adams, 1860. Type, *Tellina bruguièrei* Hanley.

Tellinungula Roemer, 1872, and *Capsa* Tryon, 1869, not Humphrey, 1797, are synonyms.

? Section *Rexithaerus* Conrad, 1869. Type, *Macoma secta* Conrad.

Subgenus **Cymatoica** Dall, 1889. Type, *Tellina undulata* Hanley (+ *occidentalis* Dall).

Subgenus **Psammacoma** Dall, 1900. Type, *Psammotæa candida* (Lamarck), Bertin.

Valves elongate, convex, thin, the posterior end markedly shorter; posterior flexure obsolete; sinus (in the type) free, or only partly coalescent with the pallial line. Tertiary to recent; warmer seas.

Section *Psammacoma* s. s. Sinus free, gibbous, short. Type, *Macoma candida* (Lamarck[1]), Bertin.

Section *Cydippina* Dall, 1900. Sinus partly coalescent below, elongated. Type, *Macoma brevifrons* Say.

Section *Psammotreta* Dall, 1900. Type, *Tellina aurora* Hanley.

Like *Psammacoma*, but shorter, with the resilium internal, shorter than and partly separated from the ligament. This section bears to *Psammacoma* a relation similar to that which *Scrobiculina* does to *Angulus* in the genus *Tellina*.

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[1] This is the *Tellina galathea* Hanley, not Lamarck, according to Bertin, and the *Tellina sericina* Jonas, 1844.

SPECIES OF THE EASTERN COAST OF NORTH AMERICA.

Genus TELLINA (Linnæus).

TELLINA INTERRUPTA Wood, 1815.

Cape Lookout, North Carolina, south to Brazil; Bermuda.

Tellina maculosa Lamarck, 1818; *Tellina antoni* Philippi, 1844, and *Tellina mexicana* Petit, 1841, are synonyms. The latter name has been retained in a varietal sense, for the more slender aspects of the species.

TELLINA LÆVIGATA Linnæus, 1758.

Tampa, on the west coast of Florida, Bermuda, and southward.

This species is not cited from Cuba by Arango, herce its range seems in need of elucidation. *Tellina lævis* Krebs, not of Rumphius, seems to be the only synonym.

TELLINA LINEATA Turton, 1819.

St. Augustine, Florida, south to Brazil.

Tellina brasiliana Lamarck, 1818, not Spengler, 1798, *Tellina striata* Montagu, 1803, not Chemnitz, *Tellina tenuis* Conrad, 1834, and *Tellina decussatula* C. B. Adams, 1845 are synonyms. The hinge is that of *Eurytellina*, but the other characters are more like the typical section of the genus.

TELLINA (LIOTELLINA) RADIATA Linnæus, 1758.

Charleston, South Carolina, south to the West Indies; Bermuda.

This is variable in color markings, *Tellina nivea* Wood, 1815, and *Tellina unimaculata* Lamarck, 1818, are color varieties.

TELLINA (MERISCA) CRYSTALLINA Wood, 1815.

Sullivans Island, South Carolina, Mazyck, 1892; St. Thomas, West Indies, Swift; Carthagena, Krebs. Also on the Pacific coast.

Tellina schrammi Récluz, 1853, is synonymous.

TELLINA (MERISCA) LINTEA Conrad, 1837.

Miocene to recent. Coast of North Carolina southward; Mobile Point, Gulf coast (Conrad).

TELLINA (MERISCA) ÆQUISTRIATA Say, 1824.

Miocene (Maryland) to recent. North Carolina coast southward to northern Brazil.

Closely resembling the preceding, but more densely sculptured and more elongated. The sinus nearly reaches the anterior adductor, and is wholly confluent below in both species.

TELLINA (ELLIPTOTELLINA) AMERICANA Dall, 1900.

Off Cape Lookout, North Carolina, in 52 fathoms sand.

TELLINA (CYCLOTELLINA) FAUSTA Donovan, 1804.

Off shore in about the latitude of Cape Hatteras, North Carolina, southward to the West Indies.

Commonly referred to *Arcopagia*, but has the sinus partly confluent below and linked by a linear scar to the anterior adductor scar.

Tellina lævis Wood, 1815, and *Tellina remies* Born, 1780, not of Linnæus, 1758, are synonyms.

TELLINA (EURYTELLINA) ALTERNATA Say, 1822.

Cape Hatteras, North Carolina, south to Belize and Samana Bay.

There are sometimes traces of the left laterals, but they are usually obsolete. The pink variety may be discriminated from the closely allied *Tellina angulosa* by the fact that in the former the pallial sinus does not touch the anterior adductor scar. This species is the *Tellina punicea* of Orbigny in part, but not of Born; and the *Tellina tayloriana* Sowerby, 1867, was founded on the pink variety.

TELLINA (EURYTELLINA) ANGULOSA Gmelin, 1792.

Florida Keys and southward to Brazil.

Tellina striata (Chemnitz) auct., *Tellina laeta* Montagu, 1804; *Tellina punicea* Orbigny, 1853, in part, but not of Born, 1780; *Donax martinicensis* Lamarck, 1818; *Tellina rosacea* King, 1830; *Tellina hanleyi* Deshayes in B. M. but not of Dunker, 1853; *Tellina* "*subradiata* Schumacher," of Arango, 1880, are synonymous. Traces of the left laterals are sometimes present.

TELLINA (EURYTELLINA) GEORGIANA Dall, 1900.

Cape Hatteras, North Carolina, southward to St. Thomas, West Indies.

This is *Tellina* var. *carolinensis* Dall, 1889, not *Tellina carolinensis* Conrad, 1875.

TELLINA (PHYLLODINA) SQUAMIFERA Deshayes, 1854.

Cape Hatteras, North Carolina, south to Sombrero, in 22 to 85 fathoms. Erroneously indicated as Chinese by Sowerby and Bertin.

TELLINA (MOERELLA) GOULDII Hanley, 1846.

Cape Hatteras, North Carolina, southward to Yucatan, in 2 to 50 fathoms. Erroneously referred to the Pacific coast by authors. The sinus touches the anterior adductor scar, and is wholly confluent below. *Tellina cuneata* Orbigny, 1846, is synonymous.

TELLINA (MOERELLA) MARTINICENSIS Orbigny, 1846.

Tampa, Florida, and Antillean fauna.

Very similar to the preceding but more strongly sculptured and with the sinus only partly confluent below, and free from the adductor scar. *Tellina obtusa* Sowerby, 1868, and *tumida* Sowerby, 1867, are synonymous.

TELLINA (ANGULUS) MAGNA Spengler, 1798.

Cape Hatteras, North Carolina, south to St. Thomas, the Virgin Islands, and Bermuda.

Though so much larger than most of the species, this is a typical *Angulus* in every particular. *Tellina acuta* Wood, 1815, and *Tellina elliptica* Lamarck, 1818, are synonyms.

TELLINA (ANGULUS) TENERA Say, 1822.

Prince Edward Island, south to the Gulf of Mexico. This shell has been called *Angulus tener*, but *Angulus* is hardly of generic value. *Tellina elucens* Mighels, 1844, was probably founded on the young of this species. *Tellina omoia* Ravenel, 1875, and *Tellina agilis* Stimpson, 1857, are identical. Another species is figured under this name[1] by Sowerby.

TELLINA (ANGULUS) TENELLA Verrill, 1872.

Cape Cod, Massachusetts, southward to New York.

Angulus modestus Verrill, 1872, not Carpenter, 1864, is synonymous. The shell referred to this species from Tampa, Florida, by me[2] appears on further study to be distinct. The name *tenella* has been used earlier in *Tellina*, but I have lost the reference.

TELLINA (ANGULUS) TEXANA Dall, 1900.

Corpus Christi Bay, Texas, and Charlotte Harbor, west Florida.

TELLINA (ANGULUS) VERSICOLOR (Cozzens) De Kay, 1843.

Stratford, Connecticut, west and south to the Antilles and to Santa Caterina, Brazil, in 15 to 50 fathoms.

This small shell, with much similarity to *Tellina tenera*, unites radial color markings which recall those of *Tellina variegata* Carpenter. *Tellina consobrina* Orbigny, 1846, is closely allied.

TELLINA (ANGULUS) SYBARITICA Dall, 1881.

Cape Hatteras, North Carolina, south through the Antilles to Brazil.

Variable in color, but recognizable by its solid shell and sharp, fine concentric grooving.

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[1] Conch. Icon., p. xxxiv, fig. 195, 1867.

[2] U. S. Nat. Mus. Bull. No. 37, 1889.

TELLINA (ANGULUS) POLITA Say, 1822.

North Carolina southward to Progreso, Mexico.

The internal anterior ray in this species is quite heavy, but not as distinctly differentiated as in *Oudardia.*

TELLINA (ANGULUS) PAUPERATA Orbigny, 1846.

Tampa Bay, Florida, south to Martinique.

Polished and apparently smooth, but showing fine concentric sculpture when magnified.

TELLINA (ANGULUS) TAMPAËNSIS Conrad, 1866.

Gulf coasts of the Southeastern United States, from Florida to Texas.

The sinus is wholly coalescent below and the internal radii are obsolete. The lateral tooth separates it from the rather similar *Macoma cerina.*

TELLINA (ANGULUS) MERA Say, 1834.

South Carolina, southward to the Bahamas.

This has been wrongly referred by Tryon to the genus *Strigilla.* It is smooth or slightly concentrically striated.

TELLINA (ANGULUS) PROMERA Dall, 1900.

West Florida, from Tampa Bay south to Curaçao, Bermuda.

Larger than *mera*, with fine, sharp distant concentric lamellæ (easily worn off) and the sinus approaching the anterior adductor scar more closely.

TELLINA (ANGULUS) SIMPLEX Orbigny, 1846.

Gulf of Mexico, southward through the Antilles.

Dredged in 60 fathoms between the Mississippi Delta and Cedar Keys, Florida.

TELLINA (ANGULUS) FLAGELLUM Dall, 1900.

Florida? (Petit). Coast of Brazil near Cape San Roque. Dredged by the U. S. Fish Commission, in 20 fathoms.

This closely resembles externally *Tellina unifasciata* Sowerby, of Port Jackson, Australia, which, however, is a thinner shell without the strong approximate lateral tooth, according to Sowerby.

TELLINA (SCISSULA) SIMILIS Sowerby, 1806.

Bermuda, Florida, and south to Venezuela.

This beautiful shell is better known to American authors by the name of *T. decora* Say (1827), but, unfortunately, there seems to be no doubt that Sowerby's species was founded on a white specimen of this species. Philippi[1] has figured a specimen under the name of *Tellina iris* Say, and for *similis* Sowerby has figured *Tellina exilis* Lamarck. Hanley[2] figures *decora* Say, but his other figures called *decora* represent some other species. His figure of *similis* represents *Tellina decora*.

TELLINA (SCISSULA) IRIS Say, 1822.

North Carolina, south to the Florida Keys.

This is not *Tellina iris* Philippi above referred to. Shells labeled *Tellina exilis* Lamarck, from the West Indies, are very close to this species, being generally larger, higher proportionally, and more brightly colored. I should not be surprised if a fuller series than I have access to might unite the two. *Tellina caribæa* Orbigny, 1846, is synonymous.

TELLINA (SCISSULA) EXILIS Lamarck, 1818.

Antillean fauna (north to Florida Keys?).

Very closely related to the preceding species, but has a longer sinus, which touches, or nearly touches, the anterior adductor scar.

TELLINA (SCISSULA) CANDEANA Orbigny, 1846.

Florida Keys, Bermuda, and the Antilles.

More wedge shaped and solid than either of the other species of this group.

Genus STRIGILLA Turton.

STRIGILLA CARNARIA Linnæus, 1758.

Beaufort, North Carolina, south to Brazil.

Cardium carneosum Da Costa, 1778, and *Strigilla areolata* Menke, 1847, are synonymous. This species is recognizable by the fact that the upper part of the pallial sinus connects the adductor scars. The sculpture is often obsolete on the umbonal angle.

STRIGILLA ROMBERGII Mörch, 1853.

Florida Keys to Brazil.

In this species, almost identical externally with the preceding, the pallial sinus does not reach the anterior adductor scars.

STRIGILLA FLEXUOSA Say, 1822.

Cape Hatteras, North Carolina, south to Haiti and Guadeloupe.

Strigilla mirabilis Philippi, 1841, is synonymous, and the species has been confused with the *Strigilla pisiformis* Linnæus.

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[1] Abbild., II, 1845.

[2] Thesaurus, 1846, pl. lvi, fig. 27.

STRIGILLA PISIFORMIS (Linnæus), 1758.

Florida Keys and Antillean fauna.

Cardium discors Montagu, 1806, is probably synonymous. This species is darker, less arcuate ventrally, and with less rude zigzag sculpture than *Strigilla flexuosa* Say. *Strigilla producta* Tryon, 1870, is markedly wider and more triangular. *S. pisiformis* was named *Lucina pulchella* by C. B. Adams in 1846.

Genus TELLIDORA Mörch.

TELLIDORA CRISTATA Recluz, 1843.

North Carolina south to Trinidad. Also Pliocene.

Tellidora lunulata Holmes, 1858, is synonymous. The left valve is the flatter; in *Tellidora burneti* Sowerby the reverse is the case.

Genus METIS H. and A. Adams.

METIS INTASTRIATA (Say), 1827.

Florida southward through the Antilles.

The name was probably a misprint for *interstriata*. *Tellina gruneri* Philippi, 1845, *Tellina inornata* (Adams fide) Krebs, 1864, not of Hanley, 1844, and *Tellina lacunosa* Bertin (ex parte), 1878, non Chemnitz, are synonymous. The species has been confounded with *Macoma constricta* Bruguière by several authors, and with *Metis ephippium* Spengler, a Chinese species.

Genus MACOMA Leach.

MACOMA CONSTRICTA (Bruguière), 1792.

New Jersey coast (Wheatley) south to Santa Caterina, Brazil.

The sinus usually, but not always, touches the anterior adductor scar; when shorter the right valve usually has it free. *Tellina cayennensis* Lamarck (as *Psammobia*), 1818, *Tellina lateralis* Say, 1827, and *Tellina inornata* Adams are synonymous, and probably *Tellina suensoni* (Mörch manuscript) Deshayes, 1854.

MACOMA KRAUSEI Dall, 1900.

Spitsbergen, Greenland, and Bering Sea.

MACOMA BALTHICA (Linnæus), 1758.

Arctic and boreal seas generally, and in cool water southward to Georgia and the Mediterranean. In the north it is chiefly littoral, and affects localities where the water is slightly brackish.

Venus fragilis O. Fabricius, 1780, not of Linnæus; *Tellina grœnlandica* (Beck) Lyell, 1839; *Psammobia fusca* Say, 1827; *Sanguino-*

laria fusca Conrad, 1831; *Tellina inconspicua* Broderip and Sowerby, 1829; *Tellina tenera* Mörch, 1857, not of Say, 1822; *Tellina fabricii* Hanley, 1847; *Tellina fragilis* Moller, 1842, not of Linnæus; *Tellina molleri* Deshayes, and *Tellina dubia* Deshayes, 1854, and probably *Tellina-plena* Sowerby, 1868; are synonymous.

The original *Tellina balthica* was the thin form from the Baltic, not the solid *Tellina solidula* Pulteney, which is better known to collectors. The former is identical with our common American type.

MACOMA CALCAREA (Gmelin), 1792.

Arctic and boreal seas generally, south to Boston Bay and Long Island Sound, on the east coast of America.

Tellina lata Gmelin, 1792; *Macoma tenera* Leach, 1819; *Tellina sabulosa* Spengler, 1798; *Tellina proxima* (Brown manuscript) Sowerby, 1839; *Tellina sordida* Couthouy, 1838, and probably *Tellina belcheri* Sowerby, 1868, are among the synonyms. The species prefers deep water, or, at least, is not littoral or estuarine.

MACOMA INFLATA (Stimpson), 1893.

Spitsbergen, Greenland, Gulf of St. Lawrence, and south to latitude 40°, in 57 to 206 fathoms.

This species was named by Stimpson in manuscript, and the name published by Dawson, but the first real definition of that name is by Verrill and Bush.[1] *Macoma moesta* Deshayes, 1854, is suspiciously similar.

MACOMA CERINA C. B. Adams, 1845.

Southern Florida and the Antilles. The pallial sinus is about half confluent below. *Tellina cerena* Krebs, 1864, is identical.

MACOMA LEPTONOIDEA Dall, 1895.

Texas coast at Matagorda Bay (Lloyd), also California. The sinus is short, high, and half confluent.

MACOMA MITCHELLI Dall, 1895.

Texas coast and north to Charleston, South Carolina. Sinus wholly confluent below; form approaching *Angulus*.

MACOMA PHENAX Dall, 1900.

Jerome Creek, Chesapeake Bay, Virginia, and Tampa Bay, Florida. Closely resembles *Tellina* (*Angulus*) *tenera* Say externally.

MACOMA TENTA Say, 1834.

Cape Cod southward to Rio la Plata.

In the warmer waters from Florida southward this species takes on a yellowish flush of color, in which state it is the *Tellina souleyetiana*

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[1] Proc. U. S. Nat. Mus., p. 778, pl. 77, fig. 1, and pl. 88, fig. 6, 1898.

Recluz, 1852 (*Tellina lacrymabunda* Deshayes), but after long study I think the two aspects can not be specifically separated. The sinus is about half confluent below. It has been named *Tellina recluziana* by Tryon in 1869, on account of the existence of *Tellina souleyeti* Hanley, 1844. I have no doubt that the original *Psammobia lusoria* Say, 1822, was based on a large specimen of this species, but it can not be recognized from Say's description and Conrad's figure.

MACOMA (CYMATOICA) ORIENTALIS Dall, 1889.

Florida Straits, south to Santo Domingo.

This appears to be distinct from, though allied to, the West Indian *Macoma* (*Cymatoica*) *arcuata* Sowerby, 1867.

Subgenus Psammacoma Dall.

MACOMA (PSAMMACOMA) TAGELIFORMIS Dall, 1900.

Texas.

Two closely allied species appear to have been generally confounded under the name of *brevifrons*. That to which the name *tageliformis* is assigned here reaches a length of 45 mm., and has the pallial sinus gibbous, short, high, and only slightly confluent below.

MACOMA (CYDIPPINA) BREVIFRONS Say, 1834.

New Jersey south to Rio Janeiro.

This differs from *M. tageliformis* in its pale orange flush over the central portion, in its usually much smaller size, and in its elongate-oval pallial sinus, extending nearly to the anterior adductor and largely confluent below. The Miocene *Tellina virginiana* Conrad, 1866, is closely allied. Say's figure does not agree with his diagnosis and, as it was published after his death, may represent another species.

MACOMA (CYDIPPINA) LIMULA Dall, 1895.

Cape Lookout, North Carolina, south to Barbados.

Always identifiable by its finely granular surface. The sinus is long and partly confluent.

Bertin cites a manuscript name, *Tellina limula* of Valenciennes, in his monograph of 1878, but as this referred to a true *Tellina*, while the present species is a *Macoma*, the name of the latter need not be changed.

MACOMA (CYDIPPINA) EXTENUATA Dall, 1900.

Between the Mississippi delta and Cedar Keys, Florida, in 32 fathoms, sand.

Elongated and with a dull surface, the sinus long and partly confluent below. If it were not for the hinge this might be referred to *Liotellina.*

Telllina eupareia and *Tellina athroa*, of Ravenel are list-names of species found by him on Sullivans Island, Charleston Harbor, South Carolina, and printed without figure or description in the catalogue of his collection, 1875. They have no standing and are unidentifiable, but have been cited in the literature. Another Ravenelian name, *Tellina omoia*, is cited by him as a synonym of *Tellina tenuis* Say, by which *Tellina tenera* Say was probably meant.

SPECIES OF THE PACIFIC COAST OF NORTH AMERICA.

Genus TELLINA Linnæus.

TELLINA CUMINGII Hanley, 1844.

Lower California to Panama (Red Sea?). This is the Pacific coast analogue of *Tellina interrupta* Wood, and the synonyms of the latter are sometimes confused with the former.

TELLINA IDÆ Dall, 1891.

(Plate IV, figs. 10, 11.)

San Pedro, California, and vicinity.

Figures of a young specimen from Catalina Island are given.

The adult has already been well figured in the Proceedings of the U. S. National Museum.[1]

TELLINA (MACALIOPSIS) LYRA Hanley, 1844.

Lower California to Tumbez, Peru.

TELLINA (MERISCA) LAMELLATA Carpenter, 1857.

San Diego, California, to Mazatlan.

This is referred to the section with doubt, as the unique specimen is so polished internally as to obscure the pallial line.

TELLINA (MERISCA) RECLUSA Dall, 1900.

San Ignacio Lagoon, Lower California, and Gulf of California.

This is the Pacific coast analogue of *Tellina lintea* Conrad of the Atlantic coast from which it differs in minor details, especially in being shorter and more triangular. *Tellina æquistriata* Say is more sharply sculptured, and has the anterior end of the pallial sinus free from the adductor scar.

TELLINA (MERISCA) DECLIVIS Sowerby, 1868.

Cerros Island, Lower California, to the Gulf of California.

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[1] XIV, pl. VI, fig. 3; pl. VII, figs. 1, 4; 1891.

TELLINA (MERISCA) CRYSTALLINA Wood, 1815.

Lower California to Panama; also Atlantic coast. The specimens from the two oceans are absolutely similar, and differ no more than individuals from either sea among themselves.

TELLINA (ELLIPTOTELLINA) PACIFICA Dall, 1900.

Panama Bay, and probably northward. This is the Pacific analogue of *Tellina* (*E.*) *americana* Dall, which is differently sculptured. From the figures *Tellina clathrata* Bertin, 1878, is a third recent species of *Elliptotellina*, but appears to be smoother and to have a much longer and more confluent sinus than either of the American species.

TELLINA (PHYLLODINA) PRISTIPHORA Dall, 1900.

Lower California, near La Paz, in 26 fathoms.

TELLINA (EURYTELLINA) RUBESCENS Hanley, 1844.

Margarita Bay, Lower California, to Panama. This is the Pacific coast analogue of *Tellina angulosa* Gmelin, which is very similar, but distinguishable. *Tellina simulans* C. B. Adams, 1852, and *Tellina punicea* Carpenter, 1857, not Born, 1778, are synonymous.

TELLINA (SCROBICULINA) VIRIDOTINCTA Carpenter, 1855.

Lower California to Panama.

TELLINA (SCROBICULINA) OCHRACEA Carpenter, 1864.

Cape St. Lucas to the Gulf of California.

Extremely similar, except in color, to the preceding species.

TELLINA (QUADRANS) COGNATA C. B. Adams, 1852.

Panamic fauna; Guatemala.

This is *Macoma cognata* of Adams and *Psammobia casta* (Deshayes) Reeve, 1857, but not *Tellina casta* Hanley, 1844.

TELLINA (TELLINIDES) BRODERIPII Deshayes, 1857.

Cape St. Lucas to Panama; Gulf of California.

This is *Tellina purpurea* Broderip and Sowerby, 1829, but not of Dillwyn, 1817; *Tellina purpurascens* Hanley, 1846, but not of Gmelin, 1792.

TELLINA (MOERELLA) SALMONEA Carpenter, 1864.

Aleutian Islands and southern part of Bering Sea, southward to the Santa Barbara Islands, California.

This is a widely distributed species, variable in color, but very constant in form. *Tellina crassula* Deshayes, 1854, if correctly described and figured, differs by the absence of lateral teeth and smaller pallial sinus.

TELLINA (MOERELLA) MEROPSIS Dall, 1900.

San Diego, California, to the Gulf of California.

This is the *Tellina gouldii* of Carpenter, 1865, but not of Hanley, 1846; it is the Pacific analogue of *Tellina promera* Dall, from which it differs by its more solid and, on the whole, smaller shell, with the sinus rising higher than the posterior adductor scar, just behind the latter, and reaching nearer to the anterior scar. There is a feeble posterior right lateral in the present species which is wanting in *Tellina promera*.

TELLINA (MOERELLA) PAZIANA Dall, 1900.

Lower California, and near La Paz. Like a miniature *Macoma liotricha* Dall, with the *Angulus* hinge and a very large, nearly free, pallial sinus.

TELLINA (MOERELLA) AMIANTA Dall, 1900.

Gulf of California.

Slender, small, white, anteriorly much produced, and externally finely concentrically striated.

TELLINA (ANGULUS) MACNEILII Dall, 1900.

Gulf of California, Guaymas.

The Pacific representative of the Atlantic *Tellina sybaritica* Dall.

TELLINA (ANGULUS) SUFFUSUS Dall, 1900.

Lower California, San Ignacio, Guaymas. Analogous to the Atlantic *Tellina colorata* Dall.

TELLINA (ANGULUS) CARPENTERI Dall, 1900.

Strait of Juan de Fuca to Lower California.

The Pacific analogue of *Tellina versicolor* Cozzens, of the Atlantic fauna, or *Tellina consobrina* Orbigny.

This is the *Angulus variegatus* Carpenter, 1864, not *Tellina* (*Angulus*) *variegata* Gmelin, 1792.

TELLINA (ANGULUS) CERROSIANA Dall, 1900.

Cerros Island, Lower California and the Gulf of California, in 8 to 26 fathoms.

Small, white, sharply concentrically striate, with the form of *Tellina sybaritica* Dall.

TELLINA (ANGULUS) RECURVA Dall, 1900.

Gulf of California.

White or pinkish, blunt and oval, with the shape of *Macoma krausei* Dall.

TELLINA (ANGULUS) MODESTA Carpenter, 1864.

Puget Sound.

Shell small, white, rather short, with a thick but obscurely defined ray behind the anterior adductor scar.

TELLINA (SCISSULA) VIRGO Hanley, 1844.

Gulf of California, La Paz, to Chiriqui.

Pink or white, compressed. The Pacific analogue of *Tellina* (*Scissula*) *exilis* Lamarck, but more compressed, more arcuate, and less pointed behind.

TELLINA (OUDARDIA) BUTTONI Dall, 1900.

Lituya Bay, Alaska, to Gulf of California.

This is the Pacific analogue of *Tellina compressa* Brocchi of the Mediterranean. The radial rib is well defined, and the shell is longer and more inequilateral than *Tellina modesta* Carpenter. The shell is white, often with a conspicuous olive green periostracum, which, however, is not unfrequently absent, or rather pale yellow or colorless. The species is the *Tellina* (*Angulus*) var. *obtusus* Carpenter, 1864, but not *Tellina obtusa* Sowerby, 1818.

TELLINA (PERONIDIA) LUTEA Gray, 1828.

Cape Espenberg, north of Bering Strait, south to Kamchatka and north Japan on the west, through Bering Sea, the Aleutians, and east to Cooks Inlet.

This fine shell is the *Tellina guildfordiæ* Gray, 1834, the *Tellina alternidentata* Broderip and Sowerby, 1829, but not the *Tellina lutea* of Krause, 1885 (which from author's specimens proves to be a *Macoma*). The *Tellina venulosa* Schrenck, 1861, from north Japan, is probably identical, or at most a variety.

TELLINA (PERONIDIA) BODEGENSIS Hinds, 1844.

Queen Charlotte Islands and Vancouver to San Diego, California; (Japan ?).

The name is misspelled *bodejensis* by Bertin, 1878, who proposes to unite with it the Miocene *Tellina emacerata* Conrad, 1849, from Oregon, a course which I regard as unwarranted, though suggested by Carpenter. The *Tellina sulcatina* Deshayes, 1854, is closely related to

Tellina bodegensis, and may be identical. It is said to be found in Japan and China, but I have seen no specimens from that region. Dunker also does not cite the species from Japan, and it may be that Deshayes's name was founded on a Californian specimen wrongly labeled as Asiatic.

TELLINA (PERONIDIA) SANTAROSÆ Dall, 1900.

Santa Rosa, San Miguel, and Santa Barbara Islands, of the Santa Barbara group, California.

This form, which may prove a special race of *Tellina bodegensis*, is thinner, flatter, less flexuous behind, with the part of the disk in front of the umbonal ridge of the left valve with the concentric sculpture suddenly obsolete; the color whiter, with translucent venulations of a radial tendency. Adult specimens look very different from *Tellina bodegensis* of the same size.

Genus STRIGILLA Turton.

STRIGILLA FUCATA Gould, 1851.

Lower California, south to Panama.

Strigilla costulifera Mörch, 1861; *Strigilla carnaria* Carpenter, 1856, not Linnæus, 1758; *Strigilla miniata* Carpenter, 1856, not of Gould, are synonymous. In color, in minuter details of sculpture, and in the presence or absence of a smooth radial streak on one or both valves, these shells are notably inconstant. Nuttall (erroneously?) reported this species from Santa Barbara, California. A posterior thickened ray or two, internally, are often developed.

STRIGILLA SINCERA Hanley, 1844.

Cape St. Lucas to Panama.

Strigilla disjuncta Carpenter, 1856, is said by Carpenter (1864) to be identical. The species is posteriorly produced, white, and grows to a large size.

STRIGILLA CICERCULA Philippi, 1846.

Gulf of California to Panama.

Strigilla maga Mörch, 1861, *Strigilla interrupta* Mörch, 1861, *Strigilla ervilia* Philippi, 1846, *Strigilla dichotoma* Philippi, 1846, and *Strigilla pisiformis* Philippi, 1846, *ex parte*, not of Linnæus, 1758, are synonymous. This form is the analogue on the Pacific coast of the West Indian *Strigilla pisiformis*.

STRIGILLA LENTICULA Philippi, 1846.

Cape St. Lucas to Central America.

Strigilla serrata Mörch, 1861, seems identical. This species is the

Pacific coast analogue of *Strigilla flexuosa* Say. All the Pacific coast species so far reported have the sinus produced to the anterior adductor scar, and confluent with the pallial line below.

Genus TELLIDORA Mörch.

TELLIDORA BURNETI Broderip and Sowerby, 1839.

Lower California, south to West Colombia.

The Pacific analogue of *Tellidora cristata* Récluz.

Genus METIS H. and A. Adams.

METIS ALTA Conrad, 1837.

Santa Barbara, California, south to San Diego.

This species is identical with *Scrobicularia biangulata* Carpenter, 1856, and is also the *Lutricola alta* of the same author. It differs from the *Metis excavata* Sowerby, 1867, which extends from the Gulf of California south to Peru and the Galapagos Islands, by its bright yellow suffusion internally, its broader hinge plate, strong and deeply immersed resilium, and usually by more or less brownish coloration externally. The only other species of the genus belonging to western North America is the *Metis dombeyi* Hanley, 1846 (not of Carpenter), distinguished by its smooth, white exterior, reddish internal flush in many specimens, and evenly oblong form. This species has been confused by Carpenter with *Macoma* (*Psammacoma*) *aurora* Hanley, of the same region, under the name of *Scrobicularia producta* (1855); but this is not the *Tellina producta* Sowerby (1868). Bertin has wrongly referred some Chinese shells to *Metis excavata*, all the species being externally very similar.

Genus MACOMA Leach.

MACOMA MIDDENDORFFII Dall, 1886.

Bering Strait to the Aleutians and eastward to Chirikoff Island, Alaska; Okhotsk Sea.

This is *Macoma edentula* Middendorff, 1851, not of Broderip and Sowerby, 1839. Recognizable by its high triangular form, solid shell, with broad hinge plate and flattened left valve.

MACOMA INCONGRUA von Martens, 1865.

Bering Strait to Japan and Puget Sound.

This is *Tellina rotundata* Sowerby, 1867, *Tellina nasuta* var. *truncata* Middendorff, 1851, not *Tellina truncata* Jonas, 1844; *Macoma californiensis* Bertin, 1878, etc.

MACOMA KRAUSEI Dall, 1909.

Icy Cape south to the Aleutians and east to the Shumagins. Greenland?

This is *Tellina lutea* A. Krause, 1885, not of Gray, 1828. I have received a very similar form from Greenland and Spitsbergen. The species is characterized by its oval compressed form, low posterior beaks, and short, hardly flexed posterior end.

MACOMA EDENTULA Broderip and Sowerby, 1839.

From Bering Strait southward to the Aleutians and Japan and eastward to Port Etches, Alaska.

This splendid species is rare, and has been much confused by authors. It is the *Tellina lata* of Middendorff, 1851, in part, but not of Gmelin. It is notable for its large size, blunt transverse form, and rather smooth surface, often with a ferruginous flush. The pallial sinus is unusually short and free for the genus. *Tellina edentula* Spengler, 1798, is a *Metis.*

MACOMA CALCAREA Gmelin, 1792.

Arctic Ocean generally and on the Pacific south to the Okhotsk and Japan seas on the west and to the Aleutians and Oregon on the east.

The synonymy of this species has been indicated in the Atlantic coast list.

MACOMA SITKANA Dall, 1900.

Kadiak, Alaska, south to Sitka (15 fathoms).

Shell like *Macoma calcarea*, but more slender, more equilateral, less flexuous, with the pallial sinus more regular, oval, and confluent below, and with the posterior end somewhat recurved dorsally.

MACOMA INQUINATA Deshayes, 1854.

Bering Strait to Monterey, California, on the east and to Japan on the west.

This variable, but on the whole very recognizable, species has been confused with *Macoma incongrua* Martens, *calcarea* Gmelin, and *nasuta* Conrad.

MACOMA INFLATULA Dall, 1897.

Aleutian Islands and southward in constantly deeper water to Ballenas Bay, Lower California.

Characterized by its strong flexure, pointed posterior end, thin inflated shell, and greenish periostracum.

MACOMA NASUTA Conrad, 1837.

Kadiak Island, Alaska, to Lower California.

This well-known species has not been seen by me from west of

Kadiak, though *Maçoma inquinata* Deshayes has frequently been reported under the name of *nasuta*. It seems to occur in Japan, where it was named *Tellina dissimilis* by von Martens, 1865, but is not the *Tellina dissimilis* of Deshayes, 1854. The young was described by Gould as *Tellina tersa*, 1852.

MACOMA LEPTONOIDEA Dall, 1895.

Santa Barbara Channel, California, in 314 to 322 fathoms. Also at Matagorda Bay, Texas.

This very distinct species occurs in shallow water on the Texas coast and in very deep water on the coast of California. It probably antedates the separation of the two oceans.

MACOMA CARLOTTENSIS Whiteaves, 1880.

Arctic Ocean south to Avatcha Bay, Kamchatka on the west, and to the Aleutians and eastward to Chilkat Inlet, Alaska.

One of the handsomest species when in perfection, and characterized especially by its brilliant periostracum and subtriangular form. *Macoma frigida* Hanley, 1844, should be compared, though very likely only a variety of *calcarea* Gmelin. *Tellina frigida* Krause, 1885, from author's specimens, proves to be the young of *Macoma balthica* Linnæus.

MACOMA LIOTRICHA Dall, 1897.

Aleutian and Shumagin islands to Puget Sound.

A thin oval shell, with glossy yellow periostracum.

MACOMA EXPANSA Carpenter, 1865.

Puget Sound to Baulinas Bay, California.

This must be regarded as a doubtful species. The two specimens upon which it was founded belong to different species and neither agrees with Carpenter's diagnosis. A large broken valve with the teeth wanting probably belongs to the preceding species. The originally more perfect pair has also met with accidents, and is really too young for satisfactory determination. Specimens from Baulinas Bay, California, collected by Stearns, which have been associated with the specimens named by Carpenter, may belong to a valid species which will carry the name.

MACOMA BALTHICA Linnæus, 1758.

Arctic and boreal seas generally. On the Pacific it has been collected in northern Japan, and as far south on the northwest coast as Monterey, California.

This widely dispersed form is abundant about Bering Sea, but the

Macoma solidula Pulteney, usually regarded as a variety of *balthica*, has not been found in that region. In addition to the synonyms mentioned in the Atlantic list, it may be mentioned that the *Tellina frigida* of Krause, 1885, is based on young *balthica*, and it is possible that the original *Tellina frigida* of Hanley, 1844, was of the same character.

MACOMA YOLDIFORMIS Carpenter, 1864.

Neah Bay, Juan de Fuca Strait, to San Diego, California.

A very uniform, brilliantly polished species.

MACOMA ALASKANA Dall, 1900.

Lituya Bay and Sitka Harbor, Alaska, in 8 to 12 fathoms.

A small species having the form of *Moerella* but the hinge of *Macoma*, with a polished greenish periostracum and the pallial sinus strikingly discrepant in the two valves.

MACOMA (CYMATOICA) UNDULATA Hanley, 1844.

Gulf of California, south to St. Elena, West Colombia.

Macoma occidentalis Dall, 1889, not *Tellina occidentalis* Mörch, 1861, is synonymous. This curious little shell is the Pacific analogue of the Antillean *Macoma orientalis* Dall.

MACOMA (REXITHAERUS) SECTA Conrad, 1837.

Victoria, British Columbia, to the Gulf of California at Guaymas, Mexico.

This is perhaps the finest shell of the genus. *Tellina ligamentina*, Deshayes, 1843, *Tellina japonica* Deshayes, 1854, and *Tellina denticulata* Sowerby, 1867, not of Deshayes, 1854, are synonymous. To the somewhat ruder northern specimens Carpenter applied in a varietal sense the manuscript Nuttallian name of *edulis*, in 1864.

MACOMA (REXITHAERUS) INDENTATA Carpenter, 1866.

Santa Barbara to San Diego, California.

MACOMA (REXITHAERUS) INDENTATA var. TENUIROSTRIS Dall, 1900.

San Pedro and Santa Barbara Islands.

This form differs from the typical *indentata* in being more elongated, with a shorter and more pointed posterior end and deeper flexure. *Tellina columbiensis* Hanley, 1844, also belongs to this section of the genus.

MACOMA (PSAMMACOMA) ELONGATA Hanley, 1844.

Lower California (lat. 30° 36′) south to Panama in 14 to 30 fathoms.

This species was confused by Carpenter in his labeling with *Tellina candida* auct., not Lamarck.

MACOMA (PSAMMACOMA) EXTENUATA var? PANAMENSIS Dall, 1900.

Panama.

This form is hardly distinguishable from the Atlantic *Macoma extenuata* Dall, but appears to have a less polished surface and to be a larger and somewhat higher shell.

MACOMA (PSAMMOTRETA) AURORA Hanley, 1844.

Gulf of California to Panama.

This species was cited and labeled by Carpenter with the name of *Tellina dombeyi* Hanley, which is a *Metis*.

It may be noted here that *Macoma* (*Macalia*) *Bruguierei* Hanley, a Chinese species, and *Macoma inornata* Hanley, a Chilean species, are erroneously referred to California in Bertin's Monograph of 1878. *Tellina pura* Gould, 1852, from Lower California, is the young of *Tellina mazatlanica* Deshayes, according to Carpenter, but the figures of Gould and Sowerby hardly sustain this view. The species is erroneously referred to Vancouver by Sowerby and Bertin. *Tellina brevirostris* Deshayes, 1854, is another species which has had a Californian habitat wrongly assigned to it.

DESCRIPTIONS OF NEW SPECIES.

ATLANTIC COAST.

TELLINA (EURYTELLINA?) GEORGIANA new species.

(Plate II, fig. 3.)

Shell of moderate size, rosaceous, more or less suffused with a yellowish tinge, and frequently with obscure paler narrow rays near the posterior slope; surface polished; valves compressed, subequilateral, the anterior somewhat longer, rounded in front, descending more rapidly and somewhat pointed behind, base arcuate; surface sculpture of fine, even, concentric grooves with wider interspaces, these, on approaching the umbonal ridge, in large part cease, those which persist continue over the umbonal angle and to the dorsal margin as rather distant sharp little elevated lamellæ, the interspaces of which are very finely obscurely radially striate; umbones not prominent, their apices usually pale; lunule and escutcheon narrow and inconspicuous; hinge normal, the right laterals well developed, the anterior subapproximate, the left laterals obsolete; pallial sinus similar in both valves, touching the anterior adductor scar, wholly confluent below. Lon., 32; alt., 17; diam., 6 mm.

Figured type.—No. 93777, U. S. N. M.; dredged by the U. S. Fish Commission in the Gulf of Mexico, at station 2387, in 32 fathoms, sand. Specimens from St. Thomas, West Indies, which appear otherwise similar, are translucent whitish instead of rosaceous. The species has a distant resemblance to the European *Tellina nitida.*

TELLINA (LIOTELLINA) IHERINGI new species.

(Plate II, fig. 2.)

Shell polished, white, with a pale olivaceous periostracum, showing darker concentric zones; moderately convex, elongated, the anterior end longer, evenly rounded, the shorter posterior end wedge-shaped. hardly flexuous, with the umbonal ridge obscure; umbones white, small, little elevated; lunule and escutcheon linear or nearly so, ligament short, deeply inset; interior white with a slight yellowish flush anteriorly; hinge normal, the teeth all present but small; pallial sinus low, reaching in front to the posterior vertical of the anterior adductor scar, confluent below. Lon., 27; alt., 13; diam., 5.5 mm.

Type.—No. 108531, U.S.N.M.; dredged by the U. S. Fish Commission off the Rio La Plata, in 10½ fathoms sand, at station 2765.

This species is not nearly related to any other American *Tellina,* and the surface shows only faint incremental lines a little stronger on the rostrum.

TELLINA (ELLIPTOTELLINA) AMERICANA new species.

(Plate II, fig. 8.)

Shell small, convex, having much the form of an *Ervilia,* white or pale straw color, with a crimson spot or streak on the dorsal margin near each end; sculpture of well-marked narrow, close, concentric ripples over the whole surface, crossed near the posterior end by feeble, close set, radial grooves; anterior end longer and slightly more pointed; beaks low, ligament short; hinge with the teeth well developed, pallial sinus short, rounded, obliquely ascending and free from the pallial line below. Lon. 8.5, alt. 5.5, diam. 3.2 mm.

Type.—No. 92154, U.S.N.M.; dredged by the U. S. Fish Commission in 52 fathoms sand, 31 miles SE. by S. from Cape Lookout, North Carolina, at station 2612; bottom temperature 67° F.

This little shell is very interesting as being the first species of the subgenus recognized in the recent state. Another of unknown habitat had been described by Bertin, in 1878, but no one had recognized its proper systematic place. A third species has been dredged by the U. S. Fish Commission on the Pacific coast, which is also described in this paper.

TELLINA (MERISCA) CRYSTALLINA Wood.

(Plate II, fig. 10.)

This species has not been reported before from the coast of the United States, so we have figured a valve collected some years ago by

Mr. W. G. Mazyck, of Charleston, South Carolina, on Sullivans Island, Charleston Harbor. The species occurs in the Antilles, where it has received the name of *Tellina schrammi* from Récluz, but a comparison with specimens from the Gulf of California does not show any distinctive characters.

TELLINA (ANGULUS) PROMERA new species.

(Plate II, fig. 11.)

Shell solid, white, rounded, triangular; the anterior end a little longer, rounded in front, the posterior shorter, slightly flexuous, bluntly pointed; surface sculptured with rather distant, very thin, sharp, little elevated lamellæ, the interspatial surface finely radially striate, the umbonal ridge fairly well marked on the right valve, corresponding to a feeble radial sulcus on the left valve; beaks elevated, rather pointed and polished; traces of a papery, straw-colored periostracum visible near the margin; lunule and escutcheon hardly discernible; hinge normal, well developed; pallial sinus rising in a peak before the posterior adductor, then depressed, rounded in front, not reaching the anterior adductor scar, less than half confluent below, in the right valve, in the left valve similar but larger. Lon. 18, alt. 14.5, diam. 7 mm.

Type.—No. 94465, U.S.N.M.; collected at Bermuda by the late Dr. G. Brown Goode.

The nearest ally of this species, and which has probably often been confounded with it, is the shell we have identified with the *Tellina mera* of Say, from which it differs as we have stated in a previous note in this paper (p. 296).

TELLINA (ANGULUS) FLAGELLUM new species.

(Plate II, fig. 6.)

Shell small, polished, white, yellowish or rosaceous, with a single dark red ray extending backward from the umbo parallel with the umbonal ridge; valves moderately convex, elongated, pointed, and slightly flexuous behind, sculptured with fine regular concentric grooves with slightly wider interspaces; hinge of *Angulus*, the approximate lateral broad and strong; pallial sinus long, rounded behind, not reaching the anterior adductor scar, and wholly confluent below. Lon. 9, alt. 5, diam. 3 mm.

Type.—No. 108534, U.S.N.M.; dredged by the U. S. Fish Commission, SE. of Cape San Roque, Brazil, in 20 fathoms; bottom temperature 79° F., at station 2758.

A species, externally very similar, from Port Jackson, Australia, was described by Sowerby in 1868, under the name of *Tellina unifasciata*, but he states that it has no lateral teeth. The present species is probably that alluded to by Bertin in 1878, as received from Florida by Petit, under the name of *Tellina unifasciata*, and which he refers to *Angulus*.

TELLINA (ANGULUS) COLORATA new species.

(Plate II, fig. 9.)

Shell small, compressed, subtriangular, suffused with rose color or pale yellow, sometimes showing minute, subtranslucent, subradial vermiculations, sculpture of faint incremental lines, the posterior end shorter, rather blunt, slightly flexuous; hinge with the lateral very short and close to the cardinals; pallial sinus subtriangular, the apex rising considerably above the level of the posterior adductor, the anterior end not reaching the anterior adductor scar, the lower portion wholly confluent; there is an obscure posterior ray. Lon. 13.5, alt. 9.5, diam. 4 mm.

Types.—No. 42865, U.S.N.M., from the island of Guadeloupe, West Indies.

TELLINA (ANGULUS) TEXANA new species.

Shell small, thin, sharply flexed, varying from ivory white, through yellowish, to pale pinkish brown; subequivalve, inequilateral, the anterior end longer, moderately convex; epidermis very thin, silky, with an iridescent play of colors upon it when fresh; beaks rather high and pointed, anterior dorsal margin subarcuate, declining into the evenly rounded anterior end; posterior end short, rapidly declining, subtruncate or obtusely pointed, markedly flexed to the right; surface near the beaks nearly smooth, toward the margin finely concentrically grooved, the grooves becoming more crowded, until in some cases the interspaces resemble minute close-set threads; there are also fine, almost microscopic, radial striæ and the usual obtuse ridge at the posterior angle; hinge normal, adjacent lateral strong; pallial sinus long, not precisely similar in both valves, but reaching the anterior adductor scar in neither; the valves, if the epidermis is lost, do not appear polished; lon. 14, alt. 8.2, diam. 4.6 mm.

Habitat.—Various localities in Corpus Christi Bay, Texas, Singley, and Charlotte Harbor, Florida, in 3 or 4 feet of water, over a sandy bottom, Dall.

From *T.* (*Angulus*) *tenella* Verrill, which is perhaps its nearest ally, it differs in outline, has more arcuate dorsal margins, a straighter base, and more attenuated posterior end. That species is grooved over the whole disk and has the grooving more sharp and regular.

Type.—No. 125539, U.S.N.M.

MACOMA (MACOMA) PHENAX new species.

Shell small, thin and fragile, polished, bluish white, subequilateral, very feebly flexed behind; beaks very low; dorsal margins declining about equally before and behind the umbo; anterior end evenly rounded, posterior end obtusely pointed, base nearly straight; hinge normal, very delicate, the teeth minute; pallial sinus long and low, subequal in the two valves, not reaching the anterior adductor scar. Lon. 14, alt. 8, diam. 3.5 mm.

Types from an artificial pond screened from the sea so that only embryos could enter, occupied for researches on the development of *Ostrea virginica* by the late Prof. John A. Ryder, at Jerome Creek, Chesapeake Bay, Virginia. The pond was made in February, 1884, and these shells were found in the mud cleaned out of it in May, 1885, so that they were, though fully adult, only 15 months old, or less. Young shells of the same species were collected by Stearns at the mouth of the Hillsboro River, Tampa Bay, Florida.

These specimens externally bear such a close resemblance to a somewhat stunted and obtuse *Tellina* (*Angulus*) *tenera* Say, that, without special scrutiny, they were identified as that species, and so remained more than fourteen years in the collection. Desiring to examine the hinge of *Tellina tenera* one day, a specimen of this lot was selected, when, to my surprise I found the hinge to be that of *Macoma*. A careful examination of all the specimens labeled *Tellina tenera* was then made and another lot of half-grown shells from Florida were found to be conspecific. There is no sculpture except inconspicuous and somewhat irregular lines of growth, and the exterior differs from *Tellina tenera* chiefly in the more obtuse beaks and posterior end and less marked flexure of the valves.

Type.—No. 61719, U.S.N.M.

MACOMA (MACOMA) MITCHELLI Dall.

(Plate II, figs. 4, 5.)

Macoma mitchelli DALL, Nautilus, IX, July, 1895, p. 33.

An illustration is now provided of this hitherto unfigured species.

MACOMA (PSAMMACOMA) EXTENUATA new species.

(Plate II, fig. 7.)

Shell small, thin, white, with a yellowish flush on the disk near the umbones; elongated, the anterior end slightly longer, rounded, posterior end more attenuated, flexuous, bluntly pointed; surface nearly smooth, not polished, sculptured only with more or less obvious incremental lines; hinge delicate, interior whitish, the pallial sinus long, but not reaching the anterior adductor scar, largely confluent below. Lon. 14, alt. 6.75, diam. 2.5 mm.

Type.—No. 94012, U.S.N.M.; dredged by the U. S. Fish Commission between the delta of the Mississippi and Cedar Keys, Florida, in 32 fathoms, sand, at station 2387.

Quite distinct from any species of our coasts so far known, but closely resembling the young of a larger valve hereafter described from Panama Bay.

MACOMA (CYDIPPINA) LIMULA Dall.

(Plate II, fig. 1.)

Macoma limula DALL, Bull. U. S. Nat. Mus. No. 37, p. 60, 1889 (name only); Nautilus, IX, July, 1895, p. 32.

This species, which has not been figured, is now illustrated. It can always be recognized by its curiously sagrinate surface.

MACOMA (PSAMMACOMA) TAGELIFORMIS new species.

Shell thin, white, elongate, longer and rounded in front, shorter and rounded-truncate behind, moderately convex; surface sculptured only with rather rude incremental lines and faint radial striations; valves unequal, the left valve more convex, but the rostrum is not perceptibly flexed; teeth small, hinge normal, pallial sinus gibbous, about half confluent below, not quite similar in both valves, extending in front of the middle of the shell. Lon. 45, alt. 26, diam. 11 mm.

Type.—No. 6086, U.S.N.M., from Corpus Christi Bay, Texas. This species and *Macoma brevifrons* will be fully illustrated in a Report on the Mollusca of Porto Rico, now in preparation.

PACIFIC COAST.

TELLINA (MERISCA) RECLUSA new species.

(Plate III, fig. 2.)

Shell white, solid, moderately convex, subtrigonal, strongly flexuous; anterior end slightly longer, rounded; posterior end keeled dorsally, wedge-shaped, twisted to the right with a very short terminal truncation; beaks small, pointed; surface sculptured, with rather close-set, little elevated, concentric sharp lamellæ, with wider, faintly radially striate interspaces; escutcheon deep, narrow, long, bordered by a minutely serrate keel on each valve, lunule small, inconspicuous; hinge strong; pallial sinus high behind, descending to the base of the adductor scar in front, wholly confluent below. Lon. 18, alt. 13, diam. 6 mm.

Types.—No. 105513, U.S.N.M., from San Ignacio Lagoon, Lower California, Hemphill. Also off Lower California, in lat. 30° 28′, by the U. S. Fish Commission, at station 3019, in 14 fathoms, Gulf of California.

This species is notable for the rasp-like quality of its surface to the touch.

TELLINA (ELLIPTOTELLINA) PACIFICA new species.

(Plate III, fig. 9.)

Shell small, oval, yellowish white, or more or less painted with rose-color, especially a spot near each end on the hinge margin; anterior end longer, both ends rounded, and the valves rather convex; sculpture of fine concentric regular grooves with wider interspaces, crossed on the posterior end by deep angular radial grooves which serrate the the valve margin and are separated by rib-like interspaces; these grooves become less pronounced anteriorly, some of them attaining the anterior third of the disk; interior polished, hinge well developed, pallial sinus longer and less oblique than in *Tellina* (*Elliptotellina*) *americana*. Lon. 8, alt. 5, diam. 3 mm.

Type.—No. 96260, U.S.N.M.; dredged in Panama Bay, in 18 fathoms, sand, at station 2798, by the U. S. Fish Commission.

This species differs from the Atlantic species by its much stronger and more extended radial sculpture, and apparently also by its brighter colors and longer pallial sinus.

TELLINA (PHYLLODINA) PRISTIPHORA new species.

(Plate IV, fig. 14.)

Shell compressed, small, the right valve flatter, nearly equilateral; the beaks compressed, acute, low, with the minute prodissoconch and the nepionic shell polished and conspicuous; surface greenish white, chalky, sculptured with evenly spaced elevated concentric lamellæ over the posterior third of the shell, with much wider faintly striated interspaces; in the right valve over the anterior two-thirds of the disk the lamellæ are obsolete except on the dorsal margin, over the umbonal fold they are conspicuous, interrupted by the sulcus above it, and rise into small squarish foliations on the posterior dorsal margin; on the anterior dorsal margin the prominences are more like serrations; on the left valve there are no lamellæ on the disk, but the foliations persist though less prominent; lunule and escutcheon developed between the foliated keels, but very narrow and rather shallow; over all the disk translucent subradial venulations are frequent; interior with the hinge strongly developed, the pallial sinus narrow, obliquely ascending and entirely free from the pallial line below. Lon. 16.5, alt. 9.5, diam. 3 mm. Another specimen, the valve figured, reaches a length of 20 mm.

Type.—No. 108575, U.S.N.M.; dredged near La Paz, Lower California, in 26½ fathoms, by the U. S. Fish Commission at Station 2823.

This is an elegantly sculptured shell, with rather remarkable characters, entirely different from any other species on the coast now known.

TELLINA (EURYTELLINA) LEUCOGONIA new species.

(Plate IV, fig. 5.)

Shell brilliantly polished, rosy in darker or lighter concentric zones, suffused with light yellowish brown, the dorsal margin and umbones white; valves subequilateral, compressed, the anterior end slightly longer; surface smooth near the beaks, but in the adult nearer the margin, especially in front, with a series of fine, concentric, rather distant, evenly spaced grooves, which near the basal middle of the disk are slightly out of harmony with the incremental lines; and on the posterior half of the shell are obsolete; a faint ridge extends from the umbo to the posterior angle of the valves; the space between this ridge is sculptured with concentric striæ, the surface slightly rippled at equal distances, the ripples stronger on the right valve; hinge normal; pallial sinus large, touching the anterior adductor scar and wholly confluent below, the elevated internal ray strong. Lon. 24, alt. 19, diam. 6 mm.

Type.—No. 102182, U.S.N.M., from the Gulf of California, Stearns collection.

This handsome shell, under a magnifier in a good light, shows extremely fine radial striæ somewhat irregularly distributed.

TELLINA (MOERELLA) MEROPSIS new species.

(Plate III, fig. 1.)

Shell small, white, solid, subequilateral, rather swollen, slightly flexed behind, with a rather bluntly pointed posterior end; surface finely concentrically closely striate, with obscure radial striulations and a papery periostracum, which sometimes has an iridescent effect and is often dehiscent; beaks low and pointed; interior white, sometimes with a pale yellow suffusion; hinge normal, the left anterior lateral small but distinct; pallial sinus large, separated from the anterior adductor scar only by the feeble slightly elevated ray. Lon. 15, alt. 11.5, diam. 6.4 mm.

Types.—No. 123410, U.S.N.M., San Diego, California: Miss Shepard.

This quite abundant little shell was confounded with *Tellina gouldii* Hanley, a West Indian species, by Carpenter, and has been called by that name by most Californian collectors.

It recalls the *Tellina mera* and *promera* rather than the genuine *Tellina gouldii*, which is compressed and polished.

TELLINA (MOERELLA) AMIANTA new species.

(Plate III, fig. 12.)

Shell elongated, rather solid, white, the anterior end produced, rounded, the posterior shorter, obliquely truncate, rather pointed;

beaks low, surface sculptured with close concentric ridges, thread-like in front and over most of the disk, but behind and on the posterior dorsal area becoming sharper and more lamellose; hinge normal, the anterior right lateral conspicuously large, a faint trace of a posterior lateral in the same valve; pallial sinus nearly touching the anterior adductor scar and wholly confluent below; there is no trace of an elevated internal ray. Lon. 12.5, alt. 6.2, diam. 3.5 mm.

Type.—No. 108560, U.S.N.M.; dredged in 14 fathoms, sand, off Cape Tepoca, Lower California, near the head of the Gulf, by the U. S. Fish Commission at station 3019.

TELLINA (MOERELLA) PAZIANA new species.

(Plate III, fig. 8.)

Shell small, thin, white, convex, the anterior end slightly longer, rounded, the posterior end bluntly pointed; surface finely concentrically sculptured by the incremental lines, covered with a very delicate dehiscent pale straw-colored epidermis; hinge well developed, a minute but distinct anterior left lateral present; interior polished, only about half the lower portion of the pallial sinus confluent, the anterior part not reaching the adductor. Lon. 10.2, alt. 7, diam. 3.5 mm.

Type.—No. 108580, U.S.N.M.; dredged in 26½ fathoms, near La Paz, Lower California, by the U. S. Fish Commission, at station 2823.

This differs from the young of *Scrobiculina viridotincta* Carpenter, which in outline it resembles, by being less polished, more inflated, and without the deep-set resilium.

TELLINA (ANGULUS) MACNEILII new species.

(Plate III, fig. 7.)

Shell small, solid, inequilateral, the anterior end longer, rounded, the posterior end quite short, depressed, bluntly pointed; color deep rosy, slightly zoned, and paler toward the basal margin; surface closely, sharply concentrically striated, the posterior dorsal area feebly imbricate, with a little obscure radial striulation; valves moderately full, flattish toward the middle of the disk; hinge strong, normal; internal ray obscure; pallial sinus long, nearly reaching the anterior adductor scar, wholly confluent below. Lon. 12.5, alt. 7.6, diam. 3.5 mm.

Types.—No. 120660, U.S.N.M., obtained at Guaymas, Mexico, by W. H. Dall.

The species is named in honor of a good collector, to whose efforts we are indebted for a number of additions to the mollusk fauna of Central America and West Mexico.

TELLINA (ANGULUS) SUFFUSA new species.

(Plate III, fig. 10.)

Shell cuneate, very thin, convex, blunt in front, pointed behind, the posterior end slightly longer, pinkish, yellowish, or translucent white in color; surface rather strongly, closely, and irregularly concentrically striate, with an unusually large and wide lunular impression, but no escutcheon to speak of; hinge normal, delicate; interior polished; the pallial sinus high, well separated from the anterior adductor, though there seems to be no trace of a ray in the specimens examined. Lon. 13.5, alt. 9.2, diam. 4.7 mm.

Type.—No. 105512, U.S.N.M., collected at San Ignacio Lagoon, Lower California, by Henry Hemphill.

This little species is quite characteristic; the unusually large lunule and shorter anterior end are especially notable.

TELLINA (ANGULUS) CERROSIANA new species.

(Plate III, fig. 11.)

Shell minute, compressed, greenish white, the anterior end longer, the surface sharply concentrically sculptured with low, thread-like lamellæ less close over the posterior dorsal area; left valve with a rather marked sulcus extending from the beak to the posterior angle; hinge normal, strong for the size of the shell; pallial sinus elongated, confluent below, nearly reaching the adductor. Lon. 5.2, alt. 3.2, diam. 1.5 mm.

Types.—No. 151957, U.S.N.M., dredged off Cerros Island, Lower California, in 9–10 fathoms, by the U. S. Fish Commission.

These little shells may not be adult, but if so they nevertheless do not agree with the young of any of the other species from this vicinity so far obtained

TELLINA (ANGULUS) PANAMENSIS new species.

(Plate III, fig. 3.)

Shell small, thin, ivory-white, polished, rather compressed, flexuous behind, the anterior end much the longer, produced and rounded, posterior end with the ligament rather deeply inset, margin obliquely descending to a rather blunt point; surface smooth or marked only by incremental lines, except near the basal margin, where there are a few incised lines with wider interspaces, not quite in harmony with the lines of growth; posterior dorsal area minutely concentrically rippled; hinge normal, delicate; pallial sinus large, not reaching the adductor, mostly confluent below; the elevated ray absent or obsolete. Lon. 9, alt. 5.25, diam. 2.5 mm.

Types.—No. 108557, U.S.N.M., dredged in 30 fathoms in Panama Bay by the U. S. Fish Commission, at station 2799.

A simple little species, but one which can hardly be united with any other known from the vicinity. Fresh specimens exhibit on the surface a lovely iridescent glow.

TELLINA (ANGULUS) RECURVA new species.

(Plate III, fig. 4.)

Shell translucent white, brilliantly polished, rather compressed, with very low beaks, the anterior side longer, produced and evenly rounded, the posterior side with the site of the ligament excavated, the posterior end rounded and slightly recurved; surface with faint, concentric, chiefly incremental sculpture, anterior end with a marked gape; hinge feeble, lateral tooth very small; pallial sinus short, subtriangular, confluent below. Lon. 12, alt. 7.5, diam. 2.75 mm.

Types.—No. 108559, U. S. N. M., dredged near the head of the Gulf of California in 24 fathoms mud, off Point San Fermin, by the U. S. Fish Commission, at station 3034.

The peculiar form of this shell distinguishes it from any other on the coast. It is most like a young *Macoma yoldiformis*, but more blunt behind, and with a different hinge. The delicate anterior right lateral is frequently broken off in separated valves.

TELLINA (ANGULUS) CARPENTERI, new name.

Angulus variegatus CARPENTER, Ann. Mag. Nat. Hist., 3d Ser., XIV, Dec. 1864, p. 5; not *Tellina variegata* Gmelin, Syst. Naturæ, 1792, p. 3237.

Gmelin's species is also an *Angulus*, and therefore the Californian form requires a new name. The elevated internal ray is absent or obsolete.

TELLINA (OUDARDIA) BUTTONI new name.

(Plate IV, figs. 12, 13.)

Angulus modestus ? var. *obtusus* CARPENTER, Suppl. Report Brit. Assoc. for 1863, p. 639, 1864; Smithsonian Miscell. Coll. No. 252, 1872, p. 125; Proc. Acad. Nat. Sci. Phila., 1865, p. 56, not *Tellina obtusa* J. SOWERBY, Min. Conch., II. pl. 179, 1818, nor *T. obtusa* G. B. SOWERBY, Conch. Iconica, 1868.

Angulus modestus of the majority of Californian collectors.

Shell elongated, subequilateral, compressed, polished, white, rounded before, slightly shorter and pointed behind, with a slight flexuosity; surface finely concentrically grooved, with wider interspaces, the sculpture stronger on the right valve and anteriorly; beaks low, inconspicuous; interior polished, white, with a well-marked thickened ray behind the anterior adductor scar; pallial sinus reaching the ray, confluent below. Lon. 16, alt. 9.5, diam. 3.5 mm.

Types.—No. 42865*a*, U.S.N.M., from the island of Guadalupe, off Lower California.

This species is much more acute behind than *Tellina* (*Oudardia*) *compressa* Brocchi, of the Mediterranean, and has not the oblique sculpture on the disk of that species.

The species named *Angulus modestus* by Carpenter, as represented by the type specimen from Puget Sound, is quite distinct from the form subsequently named by him variety *obtusus*, from southern California. The name *obtusus* being preoccupied for a species of *Tellina*, I propose the above specific name in honor of Mr. Fred. L. Button, of Oakland, California, an enthusiastic student of Californian shells. It belongs to the section *Oudardia* of Monterosato, characterized by having the elevated ray sharply defined, but is almost exactly intermediate between the more common forms of *Angulus* like *A. tener* Say and the typical species of *Oudardia*, which approaches *Scissula* by its oblique external grooving.

TELLINA (PERONIDIA) SANTAROSÆ new species.

(Plate III, fig. 6; plate IV, figs. 1, 2.)

Shell white, frequently with pale brownish concentric zonulation, and subtranslucent radial venulations; valves rather thin, compressed, hardly flexuous behind, beaks low, and nearly central; surface polished, concentrically evenly grooved with wider flat interspaces especially on the anterior half of the disk; on the posterior fourth of the right valve the interspaces are narrowed and elevated showing a tendency to become lamellose; if an imaginary line be drawn from the beak to the basal margin, in front of that line in the adult the concentric sculpture seems to fail suddenly, leaving an obscurely triangular area almost without sculpture; on the left valve the sculpture is not interrupted but appears feebler over the whole disk than in the right valve; hinge with the laterals obsolete, posterior radial callus not differentiated into a ray, pallial sinus low, short, mostly coalescent below. Lon. 51.5, alt. 24.5, diam. 6 mm. The dimensions of a similar valve of *Tellina bodegensis* Hinds are: Lon. 52, alt. 24, diam. 9.5 mm.; the beaks in the former are 20 mm. in front of the posterior end of the shell, while in the latter the distance is 23 mm.

Type.—No. 60212, U.S.N.M., collected at Santa Rosa Island, of the Santa Barbara group, California, by Stephen Bowers.

This shell is perhaps a southern race of *Tellina bodegensis*, or may prove to be a distinct species with more material. It is confined to the region about the islands and San Pedro; the northernmost specimen is from Santa Barbara, on the mainland. But we have typical specimens of *Tellina bodegensis* from as far south as San Diego. *Tellina santarosæ* seems to differ by its thinner, flatter, and more compressed shell, by details of sculpture, the form of the pallial sinus, and by being more equilateral.

TELLINA (PERONIDIA) LUTEA Gray.

(Plate IV, figs. 15, 16.)

Tellina lutea GRAY, in Wood's Index Testaceologicus, Supplement, pl. 1, fig. 3c, 1828; not of Krause.

Tellina guildfordiæ GRAY, in Griffith's Cuvier, XII, pl. 19, fig. 2, 1834.

Tellina alternidentata BRODERIP and SOWERBY, Zool. Journ., IV, p. 363; SOWERBY, Zoology of the voyage of the Blossom, Capt. Beechey, 1839, p. 153, pl. 44, fig. 5.

? *Tellina venulosa* SCHRENCK, Bull. de l'Acad. Imp. des Sci., 1861, p. 411; Amurl. Moll., 1867, p. 556, pl. xxii, figs. 2–5.

It seemed desirable that a good figure of this fine shell should be available, so one has been included. The specimen figured is No. 122562, U.S.N.M., collected at Bering Island by Governor Grebnitzki.

MACOMA KRAUSEI new species.

(Plate IV, fig. 8.)

Tellina lutea A. KRAUSE, Archiv für Naturgeschichte, 1885, p. 37; not of Gray.

Specimens obtained by Dr. Krause in the vicinity of Bering Strait, and donated by him to the U. S. National Museum, were supposed to be young specimens of *Tellina lutea* Gray. They prove, however, on careful examination, to belong to an undescribed species of *Macoma*, which is represented in the U. S. National Museum from many localities in Bering Sea and the Arctic Ocean, including specimens from both Greenland and Spitsbergen as well as the Alaskan waters.

Shell of a nearly egg-oval outline, with very low beaks, situated at the posterior third; valves not flattened but only slightly convex, marked with faint incremental sculpture and covered with an olive green, usually polished periostracum; there is hardly any posterior flexure and no rostration; hinge normal, very delicate; pallial sinus small rather low and reaching only about three-fifths of the distance from the posterior end of the shell forward: mostly confluent below. Lon. 23.5, alt. 14.5, diam. 5.7 mm.

Types.—No. 108606, U.S.N.M., collected in the Arctic Ocean north of Bering Strait by Capt. E. E. Smith, off Icy Cape in 7 to 15 fathoms.

The species has much the general appearance of *Yoldia myalis*, though nearly of the color of *Yoldia limatula*. It differs from *Macoma carlottensis* Whiteaves in not being flattened, in its rounded posterior end, and different color. When once recognized it is easily picked out from the related species. The Greenland and Spitsbergen specimens were referred to *Macoma inflata* by Jeffreys, but that species is proportionately much more inflated, more arcuate and flexuous, and never reaches so large a size. It is named in honor of Dr. Arthur Krause, who worked up the mollusks of his expedition to Alaska.

MACOMA SITKANA new species.

(Plate IV, figs. 6, 7.)

Shell thin, calcareous, elongate, nearly equilateral, white, with a dull papyraceous, grayish-olive periostracum; surface marked only by lines of growth, which are stronger posteriorly; anterior end larger and pretty evenly rounded, posterior end attenuated, rather squarely truncate, flexuous, and moderately gaping; hinge delicate, normal; pallial sinus discrepant in the two valves, in the right valve shorter and higher and about half confluent below, in the left longer, nearly reaching the adductor scars and almost entirely confluent with the pallial line below. Lon. 41, alt. 26, diam. 10 mm.

Type.—No. 108656, U.S.N.M., dredged at Sitka Harbor, Alaska, in 15 fathoms, by W. H. Dall.

This species is nearest *Macoma calcarea* Gmelin, which is less slender, larger, heavier, and more inequilateral, the outline of the pallial sinus in the left valve is more gibbous and less confluent below, and the beaks much more conspicuous.

MACOMA LEPTONOIDEA Dall.

(Plate IV, figs. 4, 9.)

Macoma leptonoidea Dall, Nautilus, IX, July, 1895, p. 33.

Type specimen.—No. 125532, U.S.N.M., from Matagorda Bay, Texas; Lloyd. Figured specimen No. 108579, U.S.N.M., dredged in 332 fathoms green mud, Santa Barbara Channel, California, by the U. S. Fish Commission, at station 2903; and also found at station 2904, near by, in 314 fathoms, the bottom temperature being 44° F.

The occurrence of this species in two such different localities is difficult to explain; the facts, however, seem beyond question, and the specimens show no differences whatever. Several years intervened between the receipt of the Texas specimen and that of the bottle of dredgings from California, so that there seems no opportunity for a confusion of labels. As the species has not hitherto been figured, illustrations of it are now furnished.

MACOMA ALASKANA new species.

(Plate III, fig. 5.)

Shell small, very inequilateral, moderately inflated, white, with a polished pale-greenish periostracum; beaks low but acute, two-fifths of the whole length of the shell from the posterior end; anterior end produced, evenly rounded, posterior end descending rapidly to a rather blunt point; surface sculptured only with faint incremental lines; hinge normal, strong for the size of the shell; pallial sinus discrepant, in the right valve small, gibbous, short, about two-thirds confluent below; in the left valve large, reaching nearly to the anterior adductor scar, and three-fourths confluent below. Lon. 14, alt. 9, diam. 4 mm.

Types.—No. 108652, U.S.N.M., dredged at Lituya Bay, Alaska, in 8 fathoms, sand, by W. H. Dall, at station 1126. The species was also obtained in 12 fathoms, mud, in Sitka Harbor, at station 1109.

This little shell looks externally like an *Angulus*, but internally has the characters of *Macoma*. It is not closely related to any of the other Macomas of the coast.

MACOMA (INDENTATA Carpenter, var.?) TENUIROSTRIS Dall.

Macoma indentata CARPENTER, Proc. Cala. Acad. Nat. Sci., III, 1866, p. 119 (*ex parte*).

The species cited was founded upon two lots of specimens, both from San Pedro, California, one young (Palmer) and fresh, the other (Cooper) dead, more or less worn valves. Dr. Carpenter remarks that it "differs from *M. umbonella* Lamarck in its *secta*-like post-ligamental wing. This being rubbed off in the large dead valves, the shell [in them] has the aspect of a very distinct species." An examination of the material in the collection of the U. S. National Museum shows that the difference above alluded to by Dr. Carpenter does not rest alone on the absence of the post-ligamental wing. The typical *indentata* is a shorter, smaller, flatter, and much less rostrate shell, besides being more inequivalve. For the rostrate form, pending the acquisition of more and fresh material, I would propose the varietal name of *tenuirostris*. It measures: lon. 55, alt. 33, and diam. 16 mm. The nearest specimen of the typical form measures respectively 44, 31, and 12 mm. The beaks are 25 mm. behind the anterior end and in *tenuirostris* 33 mm. behind it. The left valve is notably flatter than the other in the type, while in the only pair we have of the variety the valves, though flexuous, hardly differ in degree of convexity.

MACOMA (PSAMMACOMA) PANAMENSIS new species?

(Plate IV, fig. 3.)

Shell elongated, slender, thin, inequilateral, moderately convex, whitish; surface finely concentrically striated with (especially toward the basal margin) numerous obscure radial striulations; beaks rather low, anterior end longer, evenly rounded, posterior end produced, attenuated, and subrostrate; periostracum delicate, yellowish, dehiscent; hinge normal; pallial sinus long, but rather distant (in the left valve) from the adductor scar, about half confluent below, the interior of the valve near the margins with obscure striations. Lon. 32, alt. 14, diam. 6.5 mm.

Type.—No. 96252, U.S.N.M., dredged in 33 fathoms, sand, in Panama Bay, at station 2795, by the U. S. Fish Commission.

Only a left valve of this species was obtained, which bears a notable resemblance to *Macoma extenuata* Dall, from the Gulf of Mexico. In that species, besides the difference of size the pallial sinus seems to approach proportionally nearer the adductor and to be more extensively confluent below. More material is necessary to determine the relations of the Atlantic and Pacific shells.

Supplementary note.—The details of many matters which are briefly summarized in this paper may be found in full in Trans. Wagner Institute of Science, Volume III, No. 5.

EXPLANATION OF THE PLATES.

PLATE II.

FIG. 1. *Macoma limula* Dall, North Carolina; lon. 13 mm.; see p. 315.
2. *Tellina iheringi* Dall, La Plata; lon. 27.5 mm.; see p. 311.
3. *Tellina georgiana* Dall, Georgia; lon. 32 mm.; see p. 310.
4. *Macoma mitchelli* Dall, Texas; lon. 15 mm.; see p. 314.
5. The same Dall; dorsal view.
6. *Tellina* (*Angulus*) *flagellum* Dall, West Indies; lon. 9.5 mm.; see p. 312.
7. *Macoma* (*Psammacoma*) *extenuata* Dall, Gulf of Mexico; lon. 14.5 mm.; see p. 314.
8. *Tellina* (*Elliptotellina*) *americana* Dall, North Carolina; lon. 6.5 mm.; see p. 311.
9. *Tellina* (*Angulus*) *colorata* Dall, West Indies; lon. 13.5 mm.; see p. 313.
10. *Tellina* (*Merisca*) *crystallina* Wood, South Carolina; lon. 23 mm.; see p. 311.
11. *Tellina* (*Angulus*) *promera* Dall, Bermuda; lon. 18.5 mm.; see p. 312.

PLATE III.

FIG. 1. *Tellina* (*Moerella*) *meropsis* Dall, California; lon. 16 mm.; see p. 317.
2. *Tellina* (*Merisca*) *reclusa* Dall, Gulf of California; lon. 20 mm.; see p. 315.
3. *Tellina* (*Angulus*) *panamensis* Dall, Panama; lon. 9.5 mm.; see p. 319.
4. *Tellina* (*Angulus*) *recurva* Dall, Gulf of California; lon. 12 mm.; see p. 320.
5. *Macoma alaskana* Dall, Lituya Bay, Alaska; lon. 15 mm.; see p. 323.
6. *Tellina* (*Peronidia*) *santarosæ* Dall, young shell; lon. 15 mm.; see p. 321.
7. *Tellina* (*Angulus*) *macneilii* Dall, Guaymas; lon. 13 mm.; see p. 318.
8. *Tellina* (*Moerella*) *paziana* Dall, La Paz; lon. 9 mm.; see p. 318.
9. *Tellina* (*Elliptotellina*) *pacifica* Dall, Panama; lon. 8 mm.; see p. 316.
10. *Tellina* (*Angulus*) *suffusa* Dall, Lower California; lon. 13.5 mm.; see p. 319.
11. *Tellina* (*Angulus*) *cerrosiana* Dall, Cerros Island, Lower California; lon. 7 mm.; see p. 319.
12. *Tellina* (*Moerella*) *amianta* Dall, Gulf of California; lon. 13.5 mm.; see p. 317.

PLATE IV.

FIG. 1. *Tellina* (*Peronidia*) *santarosæ* Dall, Santa Barbara, California; lon. 52 mm.; see p. 321.
2. The same, interior view.
3. *Macoma* (*Psammacoma*) *panamensis* Dall, Panama; lon. 31.5 mm.; see p. 324.
4. *Macoma leptonoidea* Dall, Santa Barbara Channel, California; lon. 21 mm.; see p. 323.

5. *Tellina* (*Eurytellina*) *leucogonia* Dall, Gulf of California; lon. 34 mm.; see p. 317.
6. *Macoma sitkana* Dall, interior view, Sitka, Alaska; lon. 42 mm.; see p. 323.
7. The same, external view.
8. *Macoma krausei* Dall, Icy Cape, Arctic Ocean; lon. 23 mm.; see p. 322.
9. *Macoma leptonoidea* Dall, dorsal view; lon. 21 mm.; see p. 323.
10. *Tellina idæ* Dall, young shell, Catalina Island, California; lon. 20 mm.; see p. 301.
11. The same, interior view.
12. *Tellina* (*Oudardia*) *buttoni* Dall, interior, showing rib; California; lon. 16 mm.; see p. 320.
13. The same, external view.
14. *Tellina* (*Phyllodina*) *pristiphora* Dall, Lower California; lon. 20 mm.; see p. 316.
15. *Tellina* (*Peronidia*) *lutea* Gray, Bering Sea; lon. 60 mm.; see p. 322.
16. The same, view of the interior of the left valve.

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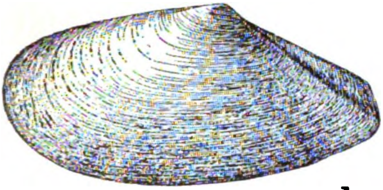
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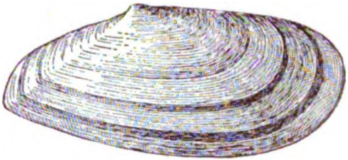
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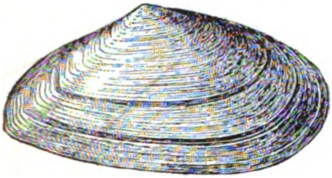
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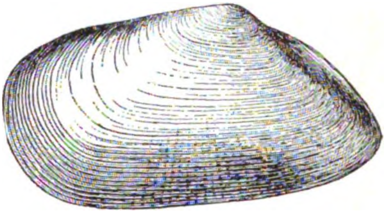
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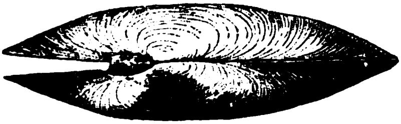
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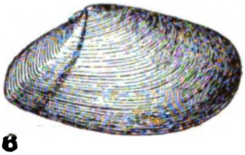
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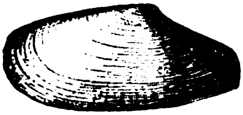
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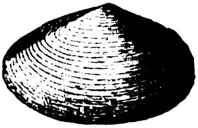
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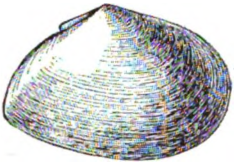
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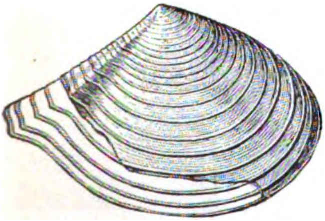
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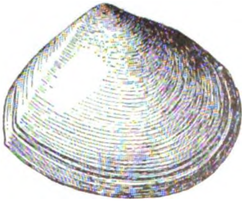
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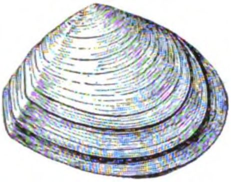

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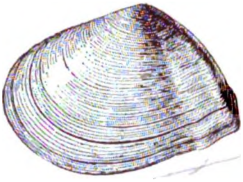

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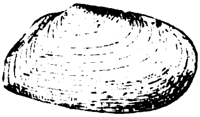

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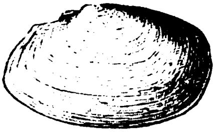

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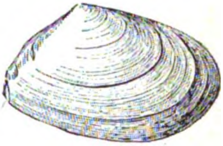

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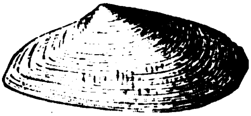

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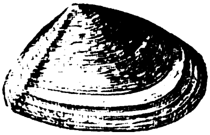

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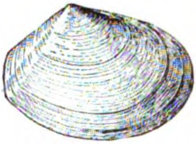

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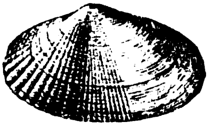

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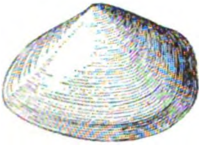

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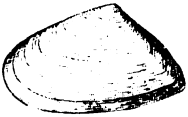

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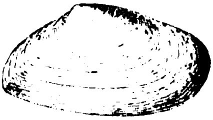

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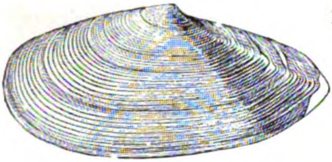
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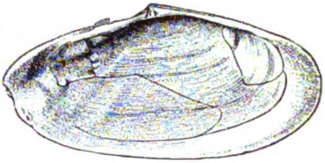
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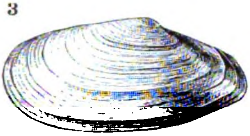
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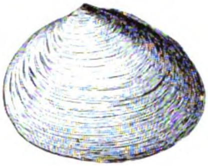
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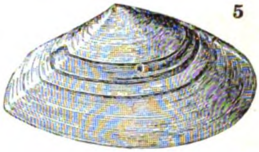
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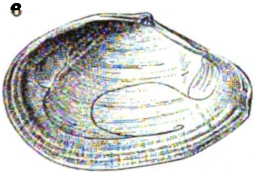
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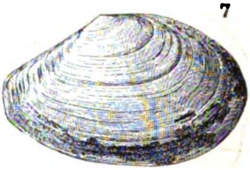
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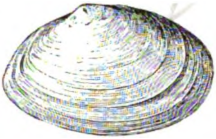
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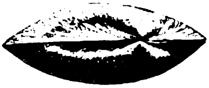
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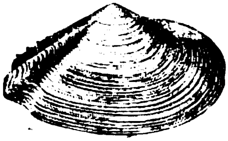
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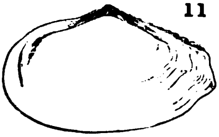
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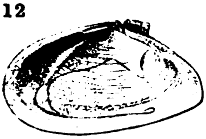
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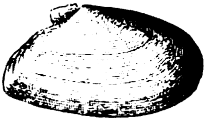
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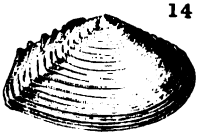
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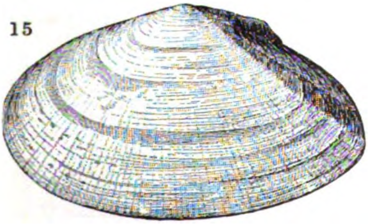
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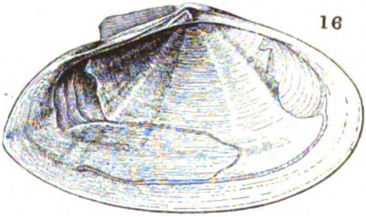
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NORTH AMERICAN TELLINIDÆ.

FOR EXPLANATION OF PLATE SEE PAGES 325, 326.

THE PELVIC GIRDLE OF ZEUGLODON, BASILOSAURUS CETOIDES (OWEN),[1] WITH NOTES ON OTHER PORTIONS OF THE SKELETON.

By FREDERIC A. LUCAS,

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NOTWITHSTANDING the length of time that the Zeuglodon has been known and the comparative abundance, though usually in a more or less fragmentary condition, of its vertebræ and ribs in many parts of the Gulf States, portions of its structure have remained somewhat problematical. This is particularly true of its limbs, and it has been an open question whether or not even vestigal hind limbs were present.

The fact that Zeuglodon bones are found in comparatively soft, superficial deposits that have been deeply gullied by the action of water, to the consequent loss of the smaller bones, is largely responsible for this lack of information, though it may also be noted that little systematic search has been made for Zeuglodon bones.

In 1894 Mr. Charles Schuchert, of the United States National Museum, visited Alabama for the express purpose of obtaining remains of Zeuglodon and succeeded in securing parts of several animals, including 24 consecutive vertebræ from the anterior portion of one individual running from the atlas to the third lumbar. This material which also comprised the scapula, humerus, radius, and ulna was briefly described[2] and used as the basis for the restoration shown at the Atlanta Exposition in 1895.

In 1896 Mr. Schuchert again visited Alabama and this time secured 35 consecutive vertebræ of one individual, counting from the penultimate forward, the small rounded vertebra which terminates the vertebral column of cetacea being apparently wanting.

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[1] Harlan's name of *Basilosaurus* antedates Owen's of *Zeuglodon* and should therefore be used; Zeuglodon remains a good popular name and is thus employed in this paper.

[2] The American Naturalist, August, 1895, pp. 745–746.

Mr. Schuchert has kindly prepared the following brief account of his two visits to Alabama, which shows the conditions under which remains of Zeuglodon occur:

The wonderful stories as to the abundance of *Basilosaurus* (=*Zeuglodon*) bones in the Gulf States, particularly in the region of Clarke County, Alabama, and the complete absence of specimens in the United States National Museum led the writer to investigate their occurrence. In this he received the hearty support of the late Dr. G. Brown Goode and Dr. George P. Merrill. The first trip was made in November, 1894, and the second in October and November, 1896. Large portions of three skeletons were secured which, together, gave a nearly complete understanding of the osseous structure of *Basilosaurus*. In addition other bones and invertebrate fossils were secured which will be mentioned beyond.

In the pioneer days of southern Alabama settlers found most of the territory wooded, but here and there were found small treeless areas which they called "prairies." These prairies in Choctaw County, Alabama, are unlike those of Illinois in that they are always situated on more or less gullied land; in fact are miniature "bad lands." They are usually a few acres in extent, but in the region of Cocoa and between Isney and Fail are several miles in length. These open places were the first to be cultivated, and being of a marly nature were easily tilled and more easily gullied by the rains. Many of these spots are now "worn-out" plantations with no particular value other than grazing land.

The collector of *Basilosaurus* remains remembering the statement as to the abundance of these bones described in text-books and elsewhere, that stone walls are built of them, will be surprised to find their abundance for economic purposes restricted to an occasional large dorsal vertebra supporting the corner of a "corn-crib." One rarely finds these bones around the habitations or fences, but badly weathered centra are often scattered over the "plantations."

The bones may occur isolated and scattered, in which case the majority are the centra of dorsal or caudal vertebræ, or more or less of a skeleton may be found in position and undisturbed or in a confused interlocking heap. Undoubtedly the then sea bottom was not a soft one since the vertebræ have generally undergone considerable disintegration, and occasionally there are marks of teeth, and slight incrustation by worm tubes and oysters. Good skulls are rarely seen; in fact but one is known, collected by Dr. Albert Koch, near Fail, and now in a German museum. The nasal region is always ruined, and if a part is present it is usually the thick back region. The teeth and ear bones or a ramus of a jaw are more apt to be present. The preservation of these animals in a normal marine deposit may be accounted for in the complete absence of regular Echinoids which as scavengers are known to grind with their jaws the bones for food.

Associated with *Basilosaurus* and about as common is the little cetacean *Dorudon*, occasionally vertebræ of a large aquatic snake (*Pterosphenus schucherti* Lucas), or the shell of the large fresh-water turtle (*Hadrianus schucherti* Hay). Vertebræ of fishes of three species and an occasional spine or shark's tooth are also met with. But the most abundant fossil in the region of Cocoa are an irregular echinoid (*Hemiaster*), *Terebratulina*, and *Ostrea falco* Dall. These are the guiding fossils to the upper limit of the "Zeuglodon bed," and but a single find of bones was made immediately above this zone. The lower limit of the "Zeuglodon bed" is marked by a great abundance of *Pecten perplanus* Morton.

The "Zeuglodon bed" in the region examined has a very limited thickness (never exceeding 10 feet and generally is restricted to about 5 feet), but apparently is of great geographical extent, since *Basilosaurus* bones are reported from Florida to Arkansas. In Choctaw County the strata are buff to whitish marl, with some green glauconitic sand. Around the bones the marl is often indurated and hardened so that they have to be chiseled out. While the associated invertebrate fossils are numerous, but few others than those mentioned can be gathered, due to the incoherent, chalky nature of the test or its complete removal by water.

The following generalized section shows the horizon in Choctaw County, Ala., for *Basilosaurus*.

Generalized section of the Zeuglodon bed (*terminology that of W. H. Dall.*)

Oligocene Vicksburgian (Red Bluff formation):

Iron-stained, reddish marl, with a hardened band about 3 feet thick near the center. The characteristic fossils are *Ostrea vicksburgensis*, *Spondylus dumosus*, and *Pecten cocoanus*. About 10 feet seen.

Eocene Jacksonian (Zeuglodon beds):

Soft yellowish-white marl abounding in small lime concretions and foraminifera. But one occurrence of *Basilosaurus* known here. Thickness, about 5 feet.

Echinoid bed. Invertebrates of a few species common—*Hemiaster*, *Terebratulina*, and *Ostrea falco*. The general horizon for *Basilosaurus*, *Dorudon*, and other vertebrates immediately below the echinoids and throughout the next zone. Thickness, 2 feet.

Soft whitish marl abounding in *Pecten perplanus*, *Ostrea trigonalis*, and *Bryozoa;* also *Cypræa fenestralis*, *Auria alabamensis*, and *Scala ranellina*. Thickness, 7 feet.

Other Jacksonian horizons come here, followed by the Claibornian.

In spite of the number of vertebræ present, these two series do not seem to quite complete the vertebral column, which apparently lacks one or two at the point of junction of the two series. The number so far known is 58, distributed as follows: Cervicals 7, dorsals 13, lumbocaudals 38.

Associated with the second series of bones were the two ossa innominata, one of which was found near the twenty-first vertebra counting from the posterior end of the series, the other near the twenty-second, as well as a bone considered to be the femur.

As this skeleton had been but little washed about after deposition, the chances or probabilities are that the pelvis belongs somewhere near these vertebræ.

Neither of the bones appears quite complete, but there is some reason to suppose that the abruptly truncated posterior end of the left os innominatum is natural, and not, as the first glance suggests, the result of a fracture. This supposition is based on the fact that the straight posterior end is slightly roughened, as if it had been, as in so many animals, capped or terminated by a cartilaginous epiphysis.

The pelvis of the eared seals, *Otariidæ*, seems to throw the most light on the morphology of the pelvis (just as the skull of *Eumetopias* was of the most service in restoring the cranium), and by its aid we are able to say that ilium, ischium, and pubis are all present, although the ilium is almost aborted and the component bones are fused in one.

The pectineal process, which is large, arises from the ilium, and not the pubis, as is shown by the pelvis of a young fur seal.

The obturator foramen is large, and seems, in spite of the degenerate condition of the pelvis, to have been traversed by a large iliac artery. It is a curious fact that in the eared seals the artery may either directly traverse the pubis or simply pass through the anterior angle of the obturator foramen, or it may be at first free and later on inclosed by bone. There is nothing to determine whether the pelvic halves were attached to the vertebræ or lay free in the flesh, as in the Cetacea, but this last supposition seems the most probable.

The transverse processes of the twenty-second and twenty-third vertebræ differ slightly from those preceding or succeeding them in being a little thicker, rougher, and slightly trihedral at their free extremities; but, unfortunately for the possible deduction that the pelvis was directly attached to either or both of these vertebræ, the roughening occurs on the superior face of the process.

The acetabulum is of good width and depth, exceeding in size that of a male fur seal, *Callorhinus*, and nearly equaling that of a fully grown female sea lion, *Eumetopias*.

There is an irregular, roughened depression, as if for a ligamentum teres, although it is a little difficult to see the necessity for a ligament in so degenerate a pelvis as that under consideration. Moreover, the round ligament is absent (according to Owen) in the eared and earless seals, although both groups have large depressions in the acetabulum.

Found near the nineteenth vertebra was a small, slender bone suggesting a femur, and so considered. There is no articular surface at either end, one extremity, which is slightly weathered, having been apparently capped with cartilage, the other having lost a portion while being taken away from the matrix. Found near the twenty-second vertebra, however, was a rounded fragment of bone of the proper size and shape for a portion of the head of the femur, and if the broken part of the supposed femur were to be restored after this fragment, it would harmonize with the os, to which it is believed to have belonged.

If the interpretation placed on this bone be correct, it will be seen that a large third trochanter is present. This, however, need not be considered surprising, since, however distant the relationship may be between Zeuglodon and the seals, it is a relationship that seems to exist, and Scott and Wortman both consider the seals to be descended from the primitive carnivores, through the Creodonts, and these are characterized by the presence of a third trochanter on the femur. Also, while it may seem a little singular to find such a definitely formed, though slender, femur present, if it and the pelvis were completely buried in the flesh, yet from the great bulk of the tail of *Basilosaurus* it appears probable that such was the case.

It may be said that the last 6 caudals present (the small terminal nodule seems to be lacking) are small, as if embedded in a fluke; that the tenth caudal from the end bears a distinct transverse process, and that the caudals increase rapidly in length from the ninth forward, as is shown by the following measurements:

Antero-posterior length of centrum of fifth vertebra, 2⅝ inches; sixth vertebra, 3¼ inches; seventh vertebra, 6 inches; eighth vertebra, 8 inches; ninth vertebra, 10 inches; twelfth vertebra, 13 inches.

The length of the left os innominatum, allowing 5 mm. for the broken portion, is 245 mm. from the anterior end of the pectineal process to the posterior end of the ischium. The length of the femur is 196 mm.

The material in the collections of the United States National Museum enables us to add a little to the diagnosis of the *Basilosauridæ*, and to differentiate the genera *Basilosaurus* and *Dorudon*. The family may be thus characterized: Dentition, i. $\frac{3}{3}$ c. $\frac{1}{1}$ pm. $\frac{4}{4}$ m. $\frac{2}{2}$?; incisors caniniform, lower molariform teeth deeply serrate on one or both edges; premaxillaries and maxillaries elongate; cervicals with compressed centra, not ankylosed, but so interlocked by processes as to be practically immovable; anterior ribs more or less expanded distally; scapula with a slender coracoidal and elongate acromial process, both directed forward as in Cetacea; forearm movable on humerus; metacarpals and phalanges elongate as in *Otariidae;* pelvis and hind limb vestigial; femur with a third trochanter.

Basilosaurus.—Molariform teeth serrate on both edges, save last lower molar and first upper pre-molar; bodies of lumbo-caudals much elongated, with low neural arch over center of centrum.

Dorudon.—Molariform teeth serrate on posterior edge only; bodies of lumbo-caudals short with high neural arch over anterior part.

In conclusion it may be said that the writer believes *Basilosaurus* left no successors, but considers that like *Hesperornis* among birds this highly modified form represents a side branch of the ceto-phocine tree.

EXPLANATION OF PLATES.

PLATE V.

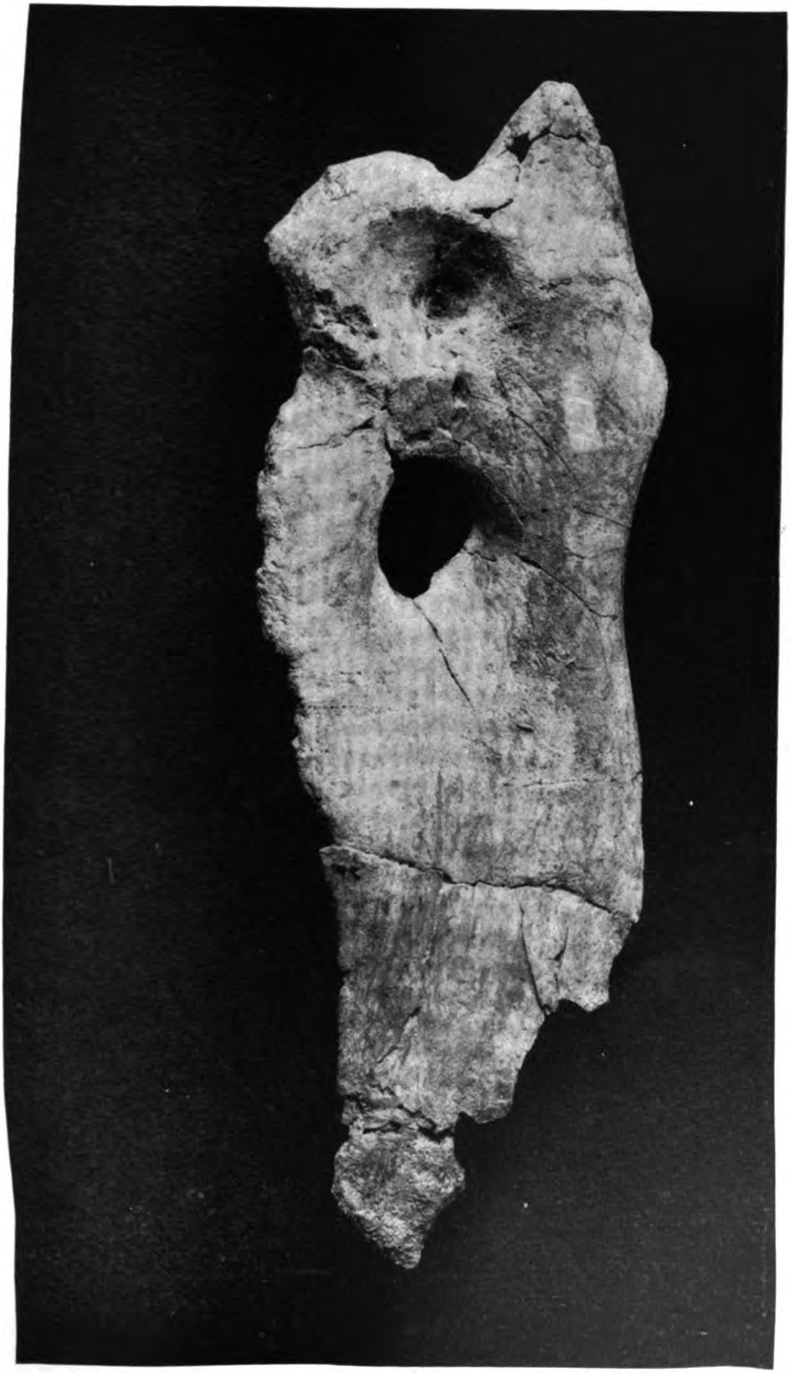
External aspect of right os innominatum of *Basilosaurus cetoides*, reduced.

PLATE VI.

Internal aspect of left os innominatum of *Basilosaurus cetoides*, reduced.

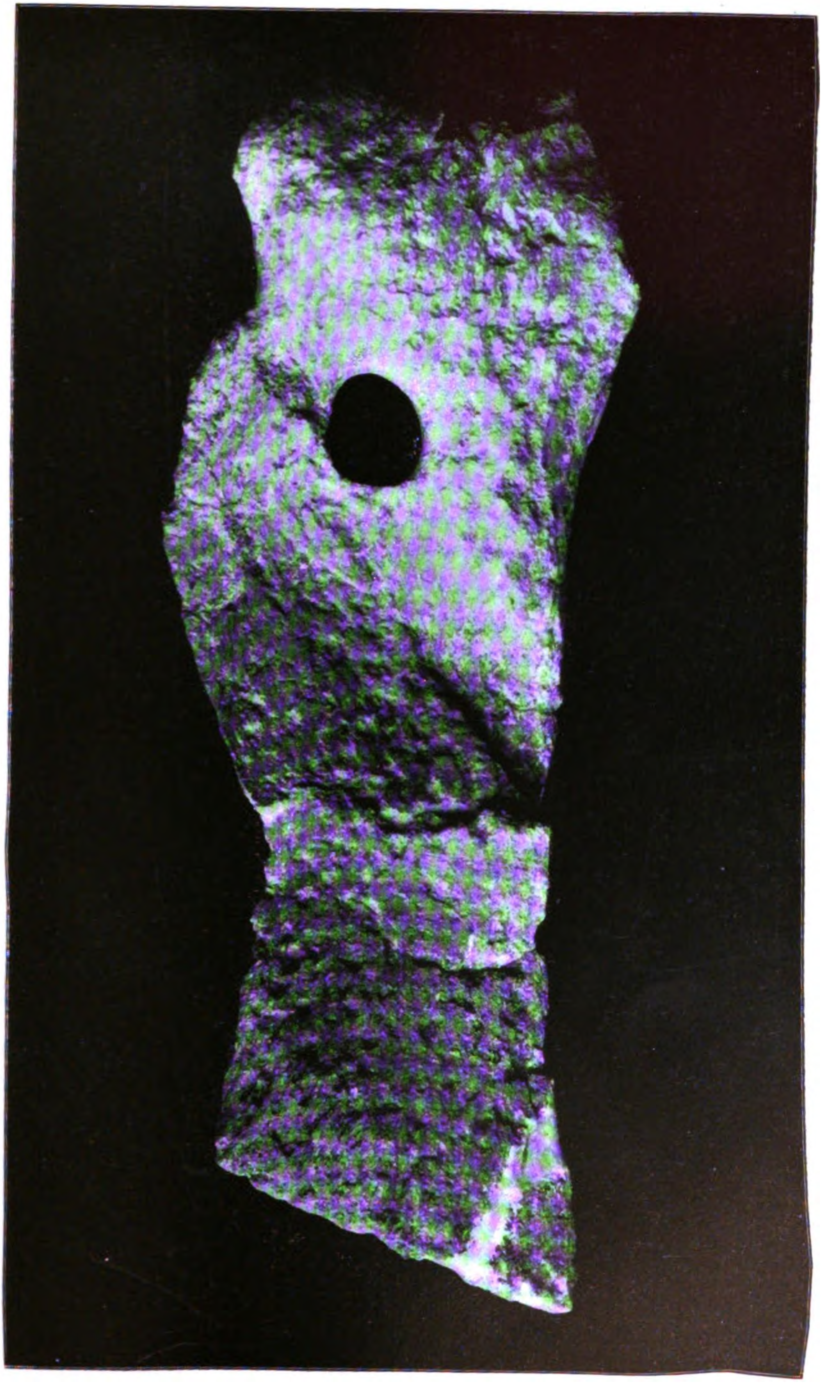
PLATE VII.

Posterior and anterior aspects of right femur of *Basilosaurus cetoides*, reduced.



EXTERNAL ASPECT OF RIGHT OS INNOMINATUM OF BASILOSAURUS CETOIDES.

FOR EXPLANATION OF PLATE SEE PAGE 331.



INTERNAL ASPECT OF LEFT OS INNOMINATUM OF BASILOSAURUS CETOIDES.

FOR EXPLANATION OF PLATE SEE PAGE 331.

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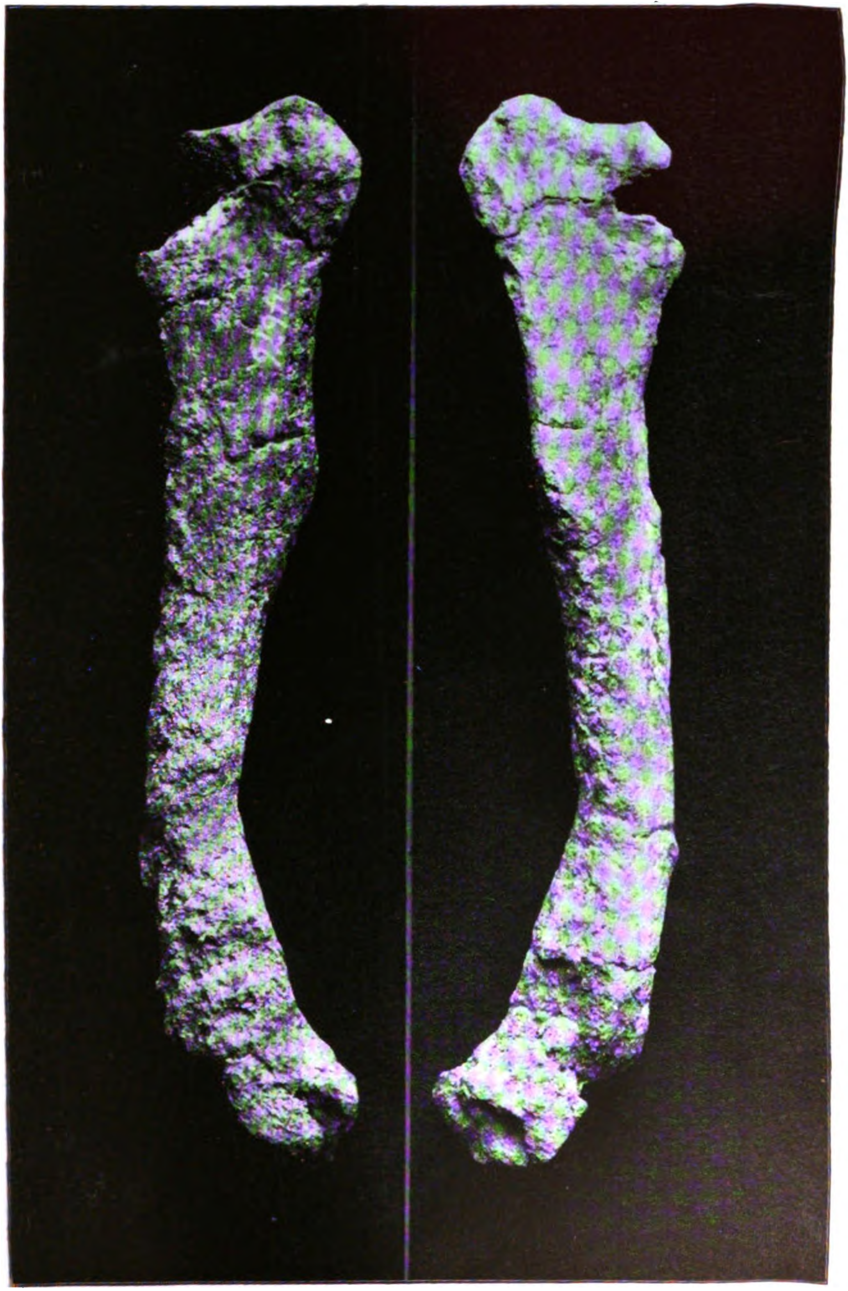

POSTERIOR AND ANTERIOR ASPECTS OF RIGHT FEMUR OF BASILOSAURUS CETOIDES.

FOR EXPLANATION OF PLATE SEE PAGE 331.

A NEW FOSSIL CYPRINOID, LEUCISCUS TURNERI, FROM THE MIOCENE OF NEVADA.

By Frederic A. Lucas,
Curator, Division of Comparative Anatomy.

The name *Leuciscus turneri* is proposed for a small fish obtained by Mr. H. W. Turner, of the U. S. Geological Survey, from the Tertiary of the west side of the valley of the Big Smoky River, Silver Peak Quadrangle, Esmeralda County, Nevada.

Type.—No. 4302a, U.S.N.M., in Catalogue of Fossil Vertebrates.

In its general aspect this fish bears a strong resemblance to such small cyprinoids as *Semotilus* and *Leuciscus*, being of much the same general proportions as *Leuciscus lineatus*. The head, as in that species, is a trifle over 3½ in the total length;[1] depth of head two-thirds of length. There are 19 to 20 precaudal vertebrae and 17 to 18 caudals, while *Leuciscus lineatus* and *Semotilus atromaculatus* have, respectively, 20+17 and 21+18.

The tail is slightly forked, the lobes slightly rounded.

The anterior end of dorsal is in line with the anterior end of ventrals, and the posterior end of dorsal is in line with anterior of anal. In *Leuciscus* the dorsal is directly over ventrals and in *Semotilus* the dorsal is behind the ventrals. In both *Leuciscus* and *Semotilus* the anterior end of the anal is a little back of posterior edge of dorsal. The fin rays are as follows: Dorsal, 9; anal, 10; pectoral, 11 to 12; ventral, 9; caudal, 23. These may be compared with *Leuciscus lineatus* and *Semotilus atromaculatus* as follows:

Species.	D	A	P	V	C
Leuciscus turneri	9	10	11	9	23
Leuciscus lineatus	9	8	17	9	23
Semotilus atromaculatus	7	8	14	8	21

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[1] According to Jordan and Evermann the head is 4¼ in total length, but this does not accord with the specimen here used for comparison.

Proceedings U. S. National Museum, Vol. XXIII—No. 1212.

The greater number of resemblances are with *Leuciscus lineatus.*

It is quite probable that the very fine rays of the pectorals have failed to make an impression, which would account for the lesser number of rays in *turneri* as compared with others.

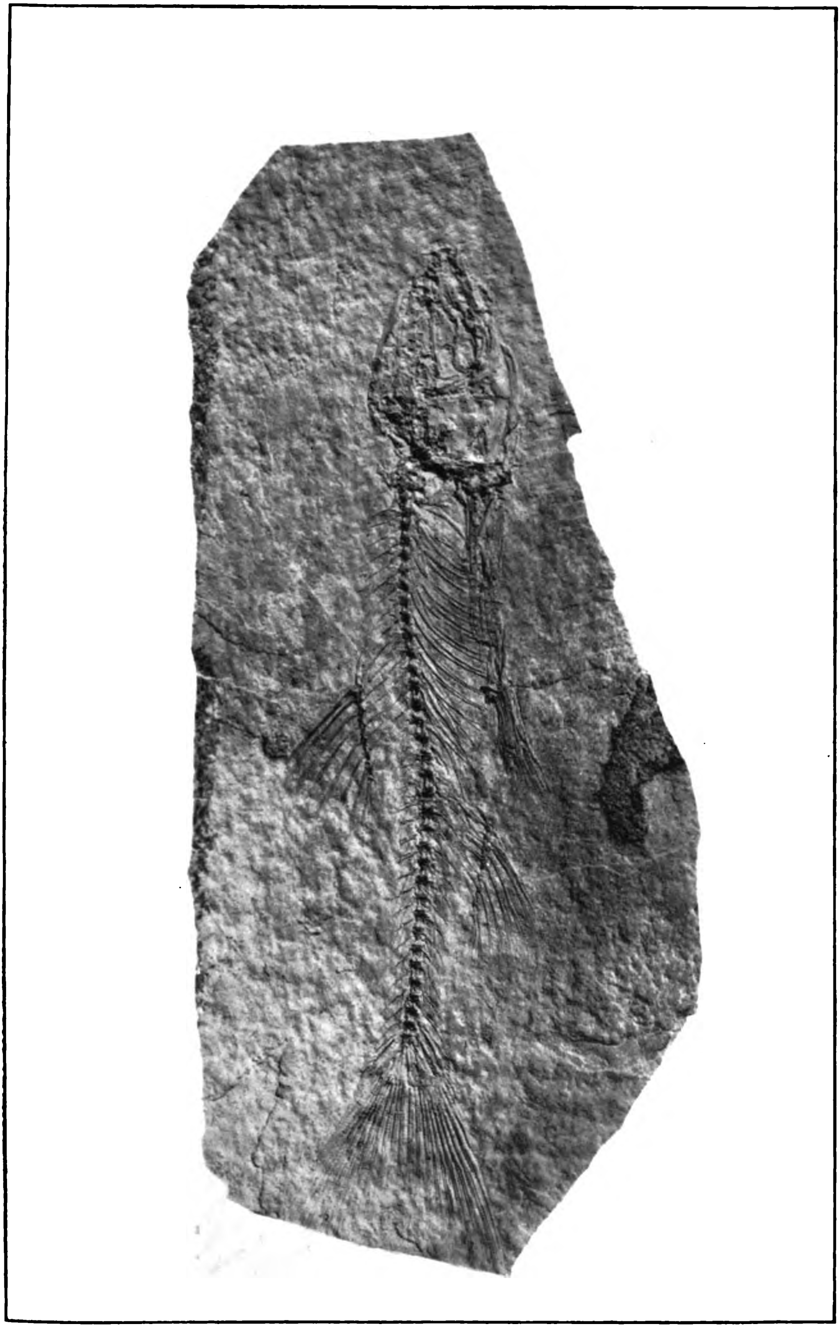
Epineurals, epihæmals, and epicentrals are present, but there are no apparent traced of epipleurals, nor should there be if the affinities of this fish are as they have been assumed.

The extreme length of the type specimen, which is of the average size, from tip of nose to center of caudal, is 5⅛ inches; from tip of nose to process of last vertebra, 4¼ inches.

With the exception of a few small fragments it is the impressions of bones that are preserved and not the bones themselves, and this fish is placed with the *Cyprinidæ* on account of its strong general resemblance to that group of fishes, since the pharyngeal teeth have not in any case been found. For the same reason it is kept in the genus *Leuciscus*, as no sufficiently good characters can be assigned to these specimens to warrant the establishment of a new genus.

EXPLANATION OF PLATE VIII.

Leuciscus turneri, reduced, from the type specimen.



TYPE SPECIMEN OF LEUCISCUS TURNERI

FOR EXPLANATION OF PLATE SEE PAGE 334.

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A LIST OF FISHES COLLECTED IN JAPAN BY KEINOSUKE OTAKI, AND BY THE UNITED STATES STEAMER ALBATROSS, WITH DESCRIPTIONS OF FOURTEEN NEW SPECIES.

By David Starr Jordan and John Otterbein Snyder,

Of the Leland Stanford Junior University.

The present paper contains a list of the fishes from Japan contained in the Museum of Leland Stanford Junior University, or sent by that institution to the U. S. National Museum in Washington, with descriptions and figures of species which seem to be new to science.

The chief material on which this list is based is a collection made in 1895 and 1896 in the Bay of Tokyo about Misaki, and in Lake Biwa, by Keinosuke Otaki, a graduate of Stanford University and now professor in the Imperial Military Academy in Tokyo, but at that time an assistant to the Imperial Fisheries Bureau of Japan. Professor Otaki's collections were obtained under the auspices of the Hopkins Seaside Laboratory on Monterey Bay, under the patronage of Mr. Timothy Hopkins.

Supplementing these collections of Professor Otaki is a small collection of fishes from Lake Biwa, sent by Prof. C. Ishikawa, of the agricultural department in the Imperial University in Tokyo, and a collection of gobies and other small fishes from Prof. K. Kishinouye of the Imperial Fisheries Bureau. A few specimens have also been sent by Prof. Kakichi Mitsukuri of the Imperial University of Tokyo.

Collections of importance were made by the *Albatross* under the direction of Lieut.-Commander Jefferson F. Moser, U. S. N., in the summer of 1896, while engaged in investigations under the direction of the United States Fur Seal Commission.

These collections were mainly from Shana Bay, Iturup Island, from Ushishir Island, from Hakodate, and from about Yokohama. The specimens from the Kuriles have been already described in Jordan and Gilbert's "Fishes of Bering Sea," those from Hakodate and Yokohama (Bay of Tokyo) are here noted for the first time.

The types of the new species are all deposited in the U. S. National Museum, together with specimens of many of the others.

The following species are here described and figured as new, the plates being drawn by Mrs. Chloe Lesley Starks, artist of the Hopkins Laboratory:

Chimæra phantasma.
Gobio biwæ.
Gobio mayedæ.
Otakia rasborina.
Congrellus meeki.
Pseudotolithus mitsukurii.
Sebastodes hakodatis.
Sebastodes scythropus.
Scorpæna onaria.
Callionymus benteguri.
Trifissus ioturus.
Blennius yatabei.
Cœlorhynchus kishinouyei.
Verasper otakii.

The following new genera are also indicated: *Ishikauia* (*steenackeri*), *Otakia* (*rasborina*), *Konosirus* (*punctatus*), *Bryttosus* (*kawamebari*), *Eteliscus* (*berycoides*), *Trifissus* (*ioturus*), *Rhombiscus* (*cinnamomeus*), *Kareius* (*scutifer*), *Usinosita* (*japonica*), *Zebrias* (*zebrina*), *Areliscus* (*joyneri*), *Insidiator* (*rudis*).

Family HOMEIDÆ.

HOMEA BURGERI (Girard).

Tokyo (Otaki).

Family PETROMYZONIDÆ.

LAMPETRA MITSUKURII Hatta, manuscript.

Tokyo (Mitsukuri). Lake Biwa (Ishikawa).

Family HETERODONTIDÆ.

HETERODONTUS JAPONICUS (Macleay & Macleay).

Tokyo (Otaki).

Family GALEIDÆ.

MUSTELUS MANAZO Bleeker.

Tokyo (Otaki). Hakodate (*Albatross*).

TRIAKIS SCYLLIUM Müller and Henle.

Tokyo (Otaki).

Family MITSUKURINIDÆ.

MITSUKURINA OWSTONI Jordan.

Tokyo; deep water (Mitsukuri).

Family SQUATINIDÆ.

SQUATINA JAPONICA (Bleeker).

Tokyo (Otaki).

Family RHINOBATIDÆ.

RHINOBATUS SCHLEGELI Müller and Henle.

Tokyo (Otaki).

Family RAJIDÆ.

RAJA MEERDERVOORTI Bleeker.

The specimen identified as above is a female, 585 mm. in length, collected by Mr. Otaki, in Tokyo.

Disk broader than long, the length eight times, the width ten times the distance between nostrils. Vent slightly nearer tip of snout than end of tail. Interorbital space deeply concave, snout acute; its length from eye two and one-fourth times the distance between nostrils. Teeth small, round and flat; six rows in each jaw. Nostril flaps coarsely fringed posteriorly. Diameter of iris equal to that of spiracle. Dorsal fins similar in shape; inserted near end of tail; space between fins equal to diameter of iris; the first fin when depressed falling far short of insertion of the second. Caudal fin small, the lobe confined entirely to upper part of tail. No lateral folds on tail. A row of strong, curved spines on the front and upper margins of eye; the spines extending backward about to posterior edge of spiracle. A median and two lateral rows of larger spines on tail; two of the median row between the fins; the spines of the lateral row point outward; two minute spines on upper part of tip of snout; a narrow, elongate patch of prickles on the ventral side of the anterior edge of disk between rostral cartilage and pectoral rays. Color in alcohol, brownish above, without spots; light below.

RAJA KENOJEI Müller and Henle.

We describe a mature male 490 mm. in length, collected by Mr. Otaki. Locality, Tokyo.

Disk broader than long; the width nine times the length measured to posterior end of pectoral, seven and one-half times the distance between the spiracles. Length of snout measured from eye, one and two-thirds times the distance between the spiracles. Vent midway between tip of snout and end of tail. Interorbital space concave; contained one and two-thirds times in width of mouth. Snout blunt. Eyes smaller than spiracles. Dermal flaps covering the deep furrows between nostrils and corners of mouth, fringed posteriorly. Dorsal fins separated by a space equal to diameter of the iris, the first fin when depressed just reaching insertion of the second; membrane of second dorsal almost separated from the very small caudal fin by a deep notch. Tail with a broad lateral fold which extends almost to its tip. A row of stout spines above the eyes; 4 strong spines on a line in middle of back between the branchial chambers; tail with numerous acute spines scattered along its dorsal surface; 2 spines between dorsals. Patches of sharp, fang-like, depressible spines near the edges of the disk opposite the eyes, and also near the angles of the pectorals; the latter in 2 rows. Small prickles on upper and lower sides of snout near its tip, and along edges of disk anterior to the lateral angles. Other parts of body above and below naked. Color in spirits, brownish with many punctulations not larger than pupil, scattered over entire upper surface except edges of fins and the quadrangular spaces between the anterior pectoral rays and the rostral cartilage; the latter region is yellowish white, similar in color to the under parts. Lateral folds of tail white.

In a young male 300 mm. long the spines above the eyes, those on the back and on the tail are present. Other parts of the body are naked, the depressible spines on pectorals having not yet appeared.

It is probable that those rays of "taille énorme" noted by Schlegel are of some other species.

Family DASYATIDÆ.

DASYATIS KUHLII (Müller and Henle).

Tokyo (Otaki).

PTEROPLATEA JAPONICA Temminck and Schlegel.

Tokyo (Otaki).

UROLOPHUS TULLBERGI Nystrom.

Tokyo (Otaki).

Family MYLIOBATIDÆ.

MYLIOBATIS TOBIJEI Bleeker.

Tokyo (Otaki). *Myliobatis cornutus* Günther is said to differ by the presence of a horn over the eye. It is doubtless the same species, the cutaneous horn being probably deciduous.

Family CHIMÆRIDÆ.

CHIMÆRA PHANTASMA Jordan and Snyder, new species.

(*Chimæra monstrosa* Temminck and Schlegel, not of Linnæus.)

Mr. Otaki secured a specimen of *Chimæra* from the Bay of Tokyo which differs from *C. monstrosa* as described and figured by European authors, in having much longer pectoral fins and larger eyes. It differs markedly from *C. ogilbyi*, an Australian form recently described by Mr. Edgar P. Waite,[1] in having a distinct anal fin, larger eyes, and a longer dorsal spine.

Type.—No. 49398, U.S.N.M.

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[1] Memoirs of Australian Museum, IV, Pt. 1, December 23, 1899.

The following description is of a male:

Length of specimen, measured from tip of snout to end of second dorsal fin, 520 mm. (The caudal filament is broken off at a point 280 mm. beyond the end of second dorsal.) Eye oblong; orbit measured between the surrounding cartilages 3 in head; longitudinal diameter of iris, 3¾ in head; center of pupil a little nearer upper edge of gill-opening than tip of snout. Claspers equal in length to diameter of pupil. Anterior laminæ of upper jaw with irregularly sinuated, sharp edges; 9 enamel rods visible from before; posterior laminæ broad; lateral and anterior edges slightly serrated; enamel rods successively larger and farther apart anteriorly; the surface with 2 longitudinal, slightly elevated ridges of enamel; laminæ of lower jaw each with 2 sharp elevations; the spaces between concave; inner posterior surfaces broad, with long, rounded ridges of enamel extending backward. Above and posterior to the eye the lateral line divides into two which subdivide, sending branches to various parts of the head; posterior to its division the lateral line passes upward and backward to a point below the dorsal spine, from which it extends just above the middle of body in short undulations, which grow less evident posteriorly to the end of dorsal fin, where it bends downward, passing along the base of caudal. Dorsal spine, equal in length to longest rays; six times the diameter of pupil; triangular in cross section; grooved posteriorly above the point of separation from the rays; edges of groove with sharp spines which are directed backward and curved downward. Anterior rays of dorsal separated from the spine at a point a little below its middle; the anterior rays are closely apposed at their bases; the two posterior ones separated by membrane. Posteriorly the fin from its base to the tip of the last ray is connected with the back by a wide membrane which, growing lower, extends almost to origin of second fin. Pectoral fin pointed; 1⅔ as long as the dorsal spine; when depressed its tip reaches middle of ventral. Ventrals pointed at tips, the posterior edges below truncate. Second dorsal fin a little higher than diameter of pupil; the posterior edge rounded; separated from caudal by a deep notch. Anal fin low, pointed posteriorly; separated from anal by a deep notch below the end of the dorsal. The lower caudal membrane extends posteriorly much farther than the upper. Color, silvery white below, growing darker above; the upper part of the snout almost black. Fins darker than body, the dorsal and anal edged with blackish.

Family SILURIDÆ.

PLOTOSUS ARAB (Forskål).

(*Plotosus anguillaris* Lacépède.)
(*Plotosus lineatus* Schlegel.)

Tokyo (Otaki).

PSEUDOBAGRUS AURANTIACUS (Temminck and Schlegel).

Tokyo (Otaki).

PARASILURUS ASOTUS (Linnæus).

(*Silurus japonicus* Temminck and Schlegel.)

Tokyo. Lake Biwa (Otaki).

Family COBITIDÆ.

MISGURNUS ANGUILLICAUDATUS (Cantor).

Tokyo (Otaki).

COBITIS JAPONICA (Temminck and Schlegel).

Lake Biwa (Otaki).

Family CYPRINIDÆ.

CYPRINUS CARPIO Linnæus.

Tokyo (Otaki).

CARASSIUS AURATUS (Linnæus).

Tokyo (Otaki).

HEMIBARBUS BARBUS (Temminck and Schlegel).

(*Barbus schlegeli* Günther.)

Lake Biwa (Otaki).
Tokyo (*Albatross*).

GOBIO BIWÆ Jordan and Snyder, new species.

(Plate IX, fig. 1.)

Type specimen.—No. 49399, U.S.N.M.

Locality.—Lake Biwa, Japan, near Matsubara. Collector, C. Ishikawa.

Description.—Head, 4⅛ in length; depth, 4½; depth of caudal peduncle, 3 in head; eye, 3; snout, 3⅛; interorbital space, 4⅛; height of dorsal, 5 in length; anal, 9; length of pectoral, 5½; ventral, 6⅜; caudal, 3⅚; number of dorsal rays, 8; anal, 7; scales in lateral series, 39; in transverse series, counting upward and forward from origin of ventral, 9.

Body oblong; the dorsal, ventral, and lateral contours sloping gradually and evenly from the region of the dorsal to base of caudal;

anterior dorsal and ventral outlines evenly curved. Interorbital space flat. Eye very large; high in head; a little nearer tip of snout than edge of opercle. Snout shorter than longitudinal diameter of eye. Mouth inferior, oblique; lips rather thick; maxillary freely protractile; extending posteriorly not quite to a vertical from anterior edge of orbit; barbels, 2, on anterior edge of maxillary just above the distal end; equal to maxillary in length. Gillrakers on first arch few and far apart; reduced to mere elevations. Pseudobranchiæ present. Teeth, 3,5–5,3; those of the first row slender and loosely attached; those of the main row high; hooked; with a narrow grinding surface. Alimentary canal short. Peritoneum with a little dusty coloring. Head naked; body covered with large scales. Lateral line slightly decurved; extending along middle of body and caudal peduncle. First fully developed ray of dorsal longest; in the folded fin extending a little beyond tip of last ray; preceded by two small and closely apposed spine-like rays; following rays successively shorter; edge of fin concave. Anal similar to dorsal, except that in the folded fin the first ray does not quite reach tip of last, and the edge of fin is straight. Ventrals inserted below base of third dorsal ray; their edges rounded. Pectoral pointed. Caudal deeply notched; the tips pointed. Upper part of head and body above lateral line finely dotted with black; the dots usually grouped on edges of scales and clustered in small spots, scattered here and there without any regularity; a row of dark spots along the lateral line; a median dark band containing a few spots of deeper color extending along the body just above the lateral line. All the fins, except ventrals, with a little dark color.

The collection contains 2 other specimens (cotypes No. 6273 L. S. Jr. Univ. Mus.), which show no great variations in shape or color.

This species is easily distinguished from *G. mayedæ* by its much more elongate body and darker color.

Measurements of Gobio biwæ.

Length of body in millimeters	65	68	60
Length of head in body	.23	.24	.23
Depth of body	.19	.18	......
Distance from snout to dorsal	.44	.45	.47
Distance from snout to ventrals	.48	.48	.49
Depth of caudal peduncle	.08	.08	.08
Length of caudal peduncle	.23	.23	.21
Length of snout	.07	.07	.07
Length of maxillary	.06	.065	.06
Longitudinal diameter of eye	.08	.07	.08
Width of interorbital space	.05	.06	.06
Depth of head at occiput	.14	.14	.15
Length of base of dorsal	.13	.13	.13
Length of longest dorsal ray	.20	.20	.20
Length of base of anal	.06	.07	.07
Length of longest anal ray	.11	.12	.10
Length of pectoral	.17	.18	.20
Length of ventrals	.15	.15	.17
Length of caudal	.24	.21	.24
Number of dorsal rays	8	8	8
Number of anal rays	7	7	7
Number of scales in lateral line	39	38	39
Number of scales between lateral line and dorsal	5	5	5

GOBIO MAYEDÆ Jordan and Snyder, new species.

(Plate IX, fig. 2.)

Type specimen.—No. 49400, U.S.N.M.

Locality.—Lake Biwa, Japan, near Karasaki. Collector, K. Otaki.

Description.—Head, 3½ in length; depth, 4; depth of caudal peduncle, 3 in head; eye, 3½; snout, 3⅖; interorbital space, 4; height of dorsal, 5½ in length; anal, 7½; length of pectoral, 5⅚; ventral, 6½; caudal, 4¼; number of dorsal rays, 8; anal, 7; scales in lateral series, 37; in transverse series, counting upward and forward from origin of ventral, 9; between insertion of dorsal and occiput, 14.

Body, deep and somewhat compressed. Snout, pointed; interorbital space flat. Eye, high in head; nearer snout than edge of opercle a distance equal to diameter of orbit. Mouth oblique, the lips fleshy; maxillary freely protractile, not quite extending to a vertical through anterior edge of orbit; barbels, 2; equal in length to diameter of pupil; attached to anterior edge of maxillary just above the distal end. Gillrakers on first arch, 7; far apart and much reduced in size. Pseudobranchiæ present. Teeth 3, 5–5, 3. Those of the inside row slender, slightly hooked; those of the outside row long, hooked; the grinding surface little developed. Alimentary canal short. Peritoneum silvery. Air bladder large. Head naked; body covered with large scales. Lateral line complete; decurved anteriorly a little below median part of body; extending along middle part of caudal peduncle. First fully developed ray of dorsal longest, preceded by two small, closely apposed, spine-like rays; edge of fin concave; when partly folded the fin is falcate. Anal rays similar in shape and arrangement to those of dorsal; edge of fin straight. Caudal deeply notched, the tips pointed. Ventrals inserted below second ray of dorsal, their posterior edges rounded. Pectoral pointed; number of rays, 15. Snout, cheeks, and opercles silvery; a lateral band of same color, brighter and more definite in outline posteriorly, extending from upper edge of gill opening to base of caudal fin; along dorsal edge of band is an indistinct line of dark pigment; dorsal half of body sparsely covered with very fine dark dots which are gathered in clusters forming indistinct and poorly defined spots along the lateral line in the median dorsal region and on the edges of many of the dorsal scales. Fins and under parts without dark color.

This species may be distinguished from *Gobio biwæ* by its much deeper and more compressed body, the silvery lateral stripe, and lighter color.

Named for Kinichiro Mayeda, a student of ichthyology in Stanford University.

Measurements of the type and of cotypes No. 6272, Leland Stanford Jr. University Museum, follow:

Measurements of Gobio mayedæ.

Length of body in millimeters	76	79	75	75	75	76	76	68
Length of head in body	.28	.26	.27	.28	.27	.27	.26	.27
Depth of body	.25	.25	.25	.26	.25	.25	.24	.24
Distance from snout to dorsal	.47	.46	.46	.48	.48	.47	.48	.47
Distance from snout to ventrals	.52	.52	.51	.52	.51	.51	.50	.50
Depth of caudal peduncle	.09	.08	.10	.10	.09	.09	.09	.09
Length of caudal peduncle	.19	.20	.19	.20	.23	.20	.21	.20
Length of snout	.09	.08	.08	.09	.09	.09	.09	.09
Length of maxillary	.085	.08	.08	.09	.09	.09	.09	.09
Longitudinal diameter of eye	.07	.07	.07	.08	.08	.08	.08	.08
Width of interorbital space	.07	.07	.07	.07	.07	.07	.07	.07
Depth of head at occiput	.17	.16	.17	.18	.17	.17	.16	.17
Length of base of dorsal	.13	.12	.13	.13	.12	.13	.13	.10
Length of longest dorsal ray	.20	.19	.19	.20	.20	.22	.19	.20
Length of base of anal	.08	.08	.09	.08	.08	.07	.07	.07
Length of longest anal ray	.13	.12	.13	.13	.13	.13	.12	.13.
Length of pectoral	.18	.18	.18	.18	.18	.18	.17	.18
Length of ventrals	.15	.15	.15	.16	.15	.16	.15	.15
Length of caudal	.23	.23	.23	.25	.24	.24	.24	.24
Number of dorsal rays	8	8	8	8	8	8	8	8
Number of anal rays	7	7	7	7	7	7	7	7
Number of scales in lateral line	37	37	36	37	37	35	37	37
Number of scales between lateral line and dorsal	5	5	5	5	5	6	5	6

PSEUDOGOBIO ESOCINUS (Temminck and Schlegel).

Lake Biwa (Otaki).

SARCOCHEILICHTHYS VARIEGATUS (Temminck and Schlegel).

Lake Biwa (Otaki).

GNATHOPOGON ELONGATUS (Temminck and Schlegel).

(*Barbus homogenes* Günther.)

Lake Biwa (Otaki).

ACHEILOGNATHUS[1] RHOMBEUM (Temminck and Schlegel).

(*Acheilognathus steenackeri* Sauvage.)

Lake Biwa. (Otaki; Ishikawa.)

A. rhombeum is distinguished at once by the very high dorsal and anal fins. The dorsal has a greater number of rays, and the body is a little deeper than that of the other species. There is a rather indistinct dark spot at the upper part of the gill-opening and a dark band on the posterior half of the body; the band originating below the insertion of the dorsal, on the row of scales above that bearing the lateral line, growing wider and extending posteriorly to where it abruptly ends on the caudal peduncle, falling short of the base of the caudal fin a distance about equal to the diameter of the pupil. Above the lateral band the body is dark colored; below it is light. On the dorsal is an indistinct light band extending the length of the fin just below the middle of the rays. The anal has a similar band.

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[1] The collection contains three species of *Acheilognathus*, which we identify as *A. rhombeum*, *A. lanceolatum*, and *A. intermedium*. A table of measurements is given for comparison.

ACHEILOGNATHUS LANCEOLATUM (Temminck and Schlegel).

Large specimens of *A. lanceolatum* generally have the body a little more elongate than that of the other species at hand. There is no dark spot at the upper edge of the gill-opening, nor is there a dark band on the body. The dorsal and anal fins are low and similar in coloration to those of *A. rhombeum*. From Lake Biwa.

ACHEILOGNATHUS INTERMEDIUM (Temminck and Schlegel).

A. intermedium has a dark, ocellate spot as large as the pupil at the upper part of the gill-opening, and also a distinct lateral band. In some cases the spot is very indistinct. The posterior part of the band does not end so abruptly as in *A. rhombeum*, but grows wider and lighter near the base of the caudal fin. The dorsal fin has two very evident light bands. The lower one corresponds in position to that on the fin of *A. rhombeum*. The color of the anal fin is variable. In some cases it is similar to the dorsal; in others there is only one white band; sometimes there is so little dark color that it forms a narrow band along the middle of the fin. From Lake Biwa.

Measurements of Acheilognathus rhombeum, A. lanceolatum, and A. intermedium.

	Species.												
	A. rhombeum.			*A. lanceolatum.*					*A. intermedium.*				
Length of body in millimeters	66½	68	62	67	58	58	54	56	55	57	52	50	47
Depth of body	.42	.38	.38	.31	.32	.35	.34	.31	.34	.36	.35	.33	.23
Length of head	.27	.25	.25	.23	.24	.25	.26	.26	.24	.24	.25	.26	.26
Height of longest dorsal ray	.25	.22	.23	.18	.20	.18	.20	.18	.19	.20	.17	.19	.18
Height of longest anal ray	.20	.20	.18	.13	.15	.24	.16	.16	.15	.15	.15	.15	.16
Number[1] of dorsal rays	15	16	16	12	12	12	12	12	12	13	14	13	13
Number of anal rays	12	13	13	12	13	12	13	13	10	11	12	12	12
Number of scales in lateral line.	36	36	35	33	34	35	35	37	37	35	33	32	34
Number of scales above lateral line	6	5	6	6	6	6	6	6	6	6	6	6	6

[1] The anterior spine-like rays are included in the above counts, as they are distinct and detached from the first fully developed ray.

BARILIUS PLATYPUS (Temminck and Schlegel).

(*Leuciscus minor* Schlegel.)

Lake Biwa. (Otaki.)

OPSARIICHTHYS UNCIROSTRIS (Temminck and Schlegel).

Lake Biwa. (Otaki.)

PSEUDORASBORA PARVA (Temminck and Schlegel).

(*Leuciscus pusillus* (Temminck and Schlegel).)

Lake Biwa. (Otaki.)

OTAKIA Jordan and Snyder, new genus.

Type.—*Otakia rasborina* new species.

Diagnosis.—Body elongate; its depth about two times that of caudal peduncle. Mouth, very oblique, lower jaw included; maxillary, protractile, not extending to orbit; no barbels. Teeth slender, hooked, a scarcely discernible grinding surface in two rows; 5 on outer row; 2 on the inner. Pseudobranchiæ present. Gill-rakers on first arch slender; pointed. Alimentary canal, short. Peritoneum, silvery. Air-bladder, large; with a median constriction. Lateral line extending along middle of body and caudal peduncle; straight, except a small upper curve on anterior 4 or 5 scales. Scales large; 40 in lateral line. Dorsal inserted a little in advance of ventrals; of 8 developed rays; anterior rays weak; edge of fin somewhat concave. Anal similar in shape to dorsal; 7 rays. Caudal deeply notched; the tips pointed. Color, light, with a silvery lateral band.

Otakia is probably related to *Pseudorasbora* and *Tribolodon*. From the former it differs in having the teeth in two rows; from the latter in having a straight lateral line, larger scales, and a silvery peritoneum.

This genus is named for Keinosuke Otaki, a graduate of Leland Stanford Junior University and an ardent and successful naturalist.

OTAKIA RASBORINA Jordan and Snyder, new species.

(Plate IX, fig. 3.)

Type specimen.—No. 49401, U.S.N.M.

Locality.—Lake Biwa, Japan. Collector, K. Otaki.

Description.—Head, 4 in length; depth, 4⅘; depth of caudal peduncle, 9½; eye, 4 in head; snout, 3½; interorbital space, 3⅓; height of dorsal, 5⅙ in length; anal, 7½; length of pectoral, 6; ventral, 6⅔; caudal, 3⅚; number of dorsal rays, 8; anal, 7; scales in lateral series, 40; in transverse series above ventral, 10; between insertion of dorsal and occiput, 17.

Body and head, elongate; caudal peduncle, deep. Interorbital space, convex. Eye, large, nearer tip of snout than posterior edge of opercle, a distance equal to one-half its diameter. Mouth, oblique; lower jaw included; maxillary protractile; not extending posteriorly to edge of orbit; no barbels. Gill-rakers on first arch, about 16; long, pointed. Pseudobranchiæ, present. Alimentary canal, short. Peritoneum, silvery. Dorsal, a little anterior to ventrals; the second ray, above insertion of ventrals; first developed ray of dorsal longest, preceded by a shorter, slender, closely-adnate, simple ray; other rays gradually shorter; edge of fin concave, giving a somewhat falcate appearance when depressed. First developed ray of anal preceded by a weak, simple, adnate ray; second ray longest; others shorter. Caudal deeply notched, the rays pointed. Pectorals obtusely pointed. Ventrals not reaching vent. Lateral line extending along middle of body and caudal peduncle; straight, except a slight upper curve on anterior 4 or 5 scales. Color, light; a silvery lateral band; a faint dark spot at base of caudal; a narrow, dark, median dorsal band extending from head to base of caudal; upper parts with minute dark dots, especially on edges of scales; dorsal fin a little dusky; others without color.

One specimen, probably young, 73 mm. long.

LEUCISCUS HAKUENSIS Günther.

(*Leuciscus hakonensis* Ishikawa).

Lake Biwa, Tokyo (Otaki, Ischikawa); Hakodate (*Albatross*).

Said to be everywhere common in the main island of Hondo.

Dr. Ishikawa suggests the change of *hakuensis* to *hakonensis*, in accordance with the proper Japanese spelling of Hakone. Such a change is, however, not allowable in our view of the law of priority. "A name is a name, without necessary meaning."

ISCHIKAUIA Jordan and Snyder, new genus.

Diagnosis.—Body compressed; caudle peduncle deep. Mouth oblique; lower jaw slightly projecting; maxillary freely protractile, not extending to edge of orbit; no barbels. Teeth, all slightly hooked, with a narrow grinding surface; in 3 rows; 3 or 4 on first of outer row, 5 on second, 2 on third or inner row. Pseudobranchiæ present. Gill-rakers on first arch, 13+4; low, pointed. Alimentary canal twice as long as body. Air bladder in 2 divisions, extending posteriorly to vent. Peritoneum with black pigment. Scales of moderate size, about 65 in lateral line; 13 from lateral line to insertion of dorsal. Lateral line sharply decurved anteriorly, gradually curving upward and extending posteriorly along middle of caudal peduncle. Dorsal inserted a little behind origin of ventrals, of 9 rays; first ray, short and closely adnate to the next; second ray, spine-like, strong; other rays, branched. Anal rays, 17; the first two spine-like ones, weak. Caudal, forked; the tips sharp. Pectorals pointed.

The genus *Ischikauia* is apparently related to *Xenocypris*. The latter has the dorsal inserted in advance of the ventrals, the scales larger, and the teeth 6, 3, 2–2, 3, 6.

Named for Prof. Chiyomatso Ishikawa, of the Imperial Museum of Tokyo.

ISCHIKAUIA STEENACKERI (Sauvage).

(*Opsariichthys steenackeri* Sauvage.)

(Plate X.)

Five specimens of *Ishikauia steenackeri* were collected in Lake Biwa by Professor Ishikawa. Others, which are lighter in color, were collected in the same lake by Mr. Otaki.

One of Professor Ishikawa's specimens, No. 6269, Leland Stanford Junior University Museum, is here described:

Head, 4⅜ in length; depth, 3⅜; depth of caudal peduncle, 8½; eye, 4 in head; snout, 4; interorbital space, 3; height of dorsal, 5⅛ in length; anal, 8⅝; length of pectoral, 5⅜; ventral, 6⅝; caudal, 4; number of dorsal rays, 9; anal, 16; scales in lateral series, 69; in transverse series, counting upward and forward from origin of ventral, 18; between insertion of dorsal and occiput, 28.

Body, including caudal peduncle, deep; rather compressed. Head, small. Interorbital space, convex. Eye, large; its diameter equal to length of snout. Mouth, small; oblique; lower jaw slightly projecting; maxillary, protractile; without barbel; not extending posteriorly to edge of orbit. Gill rakers on first arch, 17 (13+4); low; pointed. Pseudobranchiæ present. Alimentary canal, twice the length of body. Air bladder with median constriction; extending posteriorly to anal opening. Peritoneum with dark pigment. Dorsal inserted midway between tip of snout and base of caudal; posterior to origin of ventrals a distance equal to diameter of pupil; first ray short; simple; closely adnate to the next; second ray, spine-like; heavy, as long as the third; in the depressed fin the tips of the anterior rays fall beyond those of the posterior ones. Anal fin, elongate; the first two spine-like rays close together; weak; third ray longest; others gradually shorter; in the depressed fin the tips of the anterior rays reach the base of last ray. Caudal deeply notched; the tips pointed. Pectorals pointed. Ventrals obtusely rounded. Color dark; almost black on back and top of head; minute, dark dots scattered over body, except on ventral surface; posterior edge of each scale with a small dark spot; larger and more pronounced on lateral, median parts of body. Opercles brassy.

Family LEPTOCEPHALIDÆ.

LEPTOCEPHALUS MYRIASTER (Brevoort).

Tokyo (Otaki); Hakodate.

CONGRELLUS MEEKI Jordan and Snyder, new species.

(Plate XI.)

Type specimen.—No. 49397, U.S.N.M.

Locality.—Bay of Tokyo, Japan. Collector, *Albatross*. Original No. 1971.

Description.—Body and tail equal in length, the vent being midway between tip of snout and base of caudal fin. Height of body, measured behind pectorals, 2½ in length of head. Head 6½ in length. Snout rather pointed, 5 in head. Diameter of orbit equal to length of snout; cleft of mouth reaching a vertical through a point behind posterior edge of pupil. Teeth of jaws in bands, not so close together as to form a cutting edge; anteriorly the bands grow wider and the teeth higher and stronger, those at the symphysis project backward; vomerine teeth few, not close together. Tongue free. Lips rather thin. Anterior nostril with a short tube; posterior nostril on a level with lower edge of pupil. Width of gill opening 6 in length of head. Body and head smooth, without scales. Pectoral 2¾ in head. Dorsal beginning just behind base of pectoral; dorsal, caudal, and anal confluent. Body without spots or blotches; cheek and posterior part of lower jaw with small brownish dots; upper two-thirds of pectoral dusky, lower part without dark color. Dorsal and anal with black margins, which fade out at the posterior ends, leaving the caudal without dark color.

The median position of the anus, the width of the mouth, and the color of the fins form a set of characters which distinguish *Congrellus meeki* from the other species of the genus.

Only one specimen, 530 mm. long, was found.

Named for Dr. Seth Eugene Meek, who first recognized the distinctness of the species while assisting in the identification of the collection.

The genus *Congrellus* Ogilby, differs from *Congermuræna* in the pointed teeth.

Family SYNAPHOBRANCHIDÆ.

SYNAPHOBRANCHUS AFFINIS Günther.

Deep sea off Tokyo (*Albatross*).

Family MURÆNESOCIDÆ.

MURÆNESOX CINEREUS (Forskål).

(*Conger hamo* Temminck and Schlegel.)
(*Murænesox bagio* Peters.)

Tokyo (Otaki.)

Family ANGUILLIDÆ.

ANGUILLA JAPONICA Temminck and Schlegel.

Yokohama (Otaki).

Family MURÆNIDÆ.

LYCODONTIS NUBILUS (Richardson).

(*Gymnothorax similis* Richardson.)
(*Muræna kidako* Temminck and Schlegel.)
(*Muræna albimarginata* Temminck and Schlegel.)

Tokyo (Otaki).

Family PTEROTHRISSIDÆ.

PTEROTHRISSUS GISSU Hilgendorf.

(*Bathythrissa dorsalis* Günther.)

Deep water off Tokyo (*Albatross*).

Family DOROSOMATIDÆ.

KONOSIRUS Jordan and Snyder, new genus.

Konosirus (type, *Chotoëssus punctatus* Schlegel) differs from *Dorosoma* in the large mouth, very much longer gill rakers, very low anal, and other characters.

Konoshiro is the Japanese name of the typical species.

KONOSIRUS PUNCTATUS (Temminck and Schlegel).

Tokyo (Otaki).

Family CLUPEIDÆ.

CLUPANODON MELANOSTICTUS (Temminck and Schlegel).

Tokyo (*Albatross*).

SARDINELLA ZUNASI (Bleeker).

(*Clupea kowal* Temminck and Schlegel, not of Cuvier and Vallenciennes.)

Tokyo (Otaki).

Family ARGENTINIDÆ.

OSMERUS DENTEX Steindachner.

Tokyo (Otaki).

Hakodate (*Albatross*). Not evidently different from Alaskan specimens, though the teeth seem stronger.

Family SALMONIDÆ.

ONCORHYNCHUS NERKA (Walbaum).

Northern Hokkaido (*Albatross*).

ONCORHYNCHUS KISUTCH (Walbaum).

(*Salmo macrostomus Günther*).

Hakodate (*Albatross*).

Lake Biwa (Otaki).

These specimens seem to belong to *O. kisutch*, but differ in color, there being no dark shade on the dorsal fin.

SALMO PERRYI Brevoort.

Lake Biwa (Ishikawa). A black-spotted trout may be provisionally identified as *S. perryé*.

PLECOGLOSSUS ALTIVELIS (Temminck and Schlegel).

Lake Biwa (Otaki).

Family SALANGIDÆ.

SALANX MICRODON Bleeker.

Tokyo, in rivers (Otaki).
Teeth small; pectoral rays 15.

Family SYNODONTIDÆ.

AULOPUS JAPONICUS Günther.

Tokyo (Otaki).

SAURIDA ARGYROPHANES Richardson.

(*Aulopus elongatus* Schlegel.)

Tokyo (Otaki).

TRACHINOCEPHALUS TRACHINUS (Temminck and Schlegel).

(*Saurus myops* Bloch and Schneider,)
(*Saurus limbatus* Eydoux and Souleyet.)

Tokyo (Otaki).

Family STERNOPTYCHIDÆ.

STERNOPTYX DIAPHANUS Herrmann.

Deep sea off Eastern Hokkaido: killed by earthquake and captured floating.

Family PŒCILIIDÆ.

APLOCHEILUS LATIPES (Temminck and Schlegel).

Tokyo; in streams and rice fields (Otaki).

Family SYNGNATHIDÆ.

SIPHOSTOMA SCHLEGELI (Kaup).

(*Syngnathus tenuirostris* Schlegel, not of Rathke.)

Tokyo (Otaki).

Family AULORHYNCHIDÆ.

AULICHTHYS JAPONICUS Brevoort.

Yokohama (Otaki).

Family FISTULARIIDÆ.

FISTULARIA PETIMBA Lacépède.

(*Fistularia serrata* Cuvier,)
(*Fistularia immaculata* Cuvier.)

Tokyo (Otaki).

Family GASTEROSTEIDÆ.

PYGOSTEUS JAPONICUS (Steindachner.)

Nagoya (Otaki).

GASTEROSTEUS CATAPHRACTUS Pallas.

Myiako (Otaki).

Family EXOCŒTIDÆ.

CYPSELURUS AGOO Temminck and Schlegel.

(*Exocœtus doderleinii* Steindachner.)

Tokyo; 3 specimens (Otaki).

A flying-fish which we identify as *Cypselurus agoo* is distinguished by having about 58 scales in the lateral series; the first or upper pectoral ray is strong, long, and simple; the second ray is branched. A second species of *Cypselurus*, probably undescribed, has fewer scales in the lateral line (46), the first and second pectoral rays short and simple, the third branched.

Family HEMIRAMPHIDÆ.

HYPORHAMPHUS SAJORI (Temminck and Schlegel).

Tokyo (Otaki).

Family ESOCIDÆ.

TYLOSURUS ANASTOMELLA (Cuvier and Valenciennes).

Tokyo (Otaki). Hakodate (*Albatross*).

Family SPHYRÆNIDÆ.

SPHYRÆNA JAPONICA Cuvier and Valenciennes.

Tokyo (Otaki).

Family MUGILIDÆ.

MUGIL HÆMATOCHILUS Temminck and Schlegel.

(*Mugil joyneri* Günther.)

Tokyo (Otaki). Hakodate (*Albatross*).

Family BERYCIDÆ.

BERYX SPLENDENS Lowe.

Tokyo (Otaki).

Family SCOMBRIDÆ.

SCOMBER COLIAS Gmelin.

(*Scomber auratus* Houttuyn.)
(*Scomber japonicus* Houttuyn.)
(*Scomber pneumatophorus*, *major* and *minor* Schlegel.)
(*Scomber saba* Bleeker (= *major* Schlegel).)
(? *Scomber janesaba* Bleeker (= *minor* Schlegel).)

(*Scomber tapeinocephalus* Bleeker.)
(*Scomber pneumatophorus* De la Roche.)

Tokyo (Otaki); Hakodate.

AUXIS THAZARD Lacépède.

Tokyo (Otaki).

THUNNUS SCHLEGELI (Steindachner).

Tokyo (Otaki).

SARDA ORIENTALIS (Temminck and Schlegel).

Tokyo (Otaki).

SCOMBEROMORUS SINENSIS (Lacépède).

(*Cybium chinensis* Schlegel.)
(*Cybium niphonium* Cuvier and Valenciennes.)

Tokyo (Otaki.)

Family TRICHIURIDÆ.

TRICHIURUS JAPONICUS Temminck and Schlegel.

Tokyo (Otaki).

Family CARANGIDÆ.

SERIOLA QUINQUERADIATA Temminck and Schlegel.

Yokohama; Tokyo.

SERIOLA PURPURASCENS Temminck and Schlegel.

(*Seriola dumerili* Steindachner, not of Risso.)

Yokohama (Otaki).

DECAPTERUS RUSSELLI (Rüppell).

(*Caranx kurra* Cuvier and Valenciennes.)
(*Caranx maroadsi* Temminck and Schlegel.)
(*Decapterus kurroides* Bleeker.)

Yokohama (Otaki); Nagasaki; Tokyo.

DECAPTERUS MUROADSI (Temminck and Schlegel).

Tokyo (Otaki).

TRACHURUS JAPONICUS Temminck and Schlegel.

Yokohama (Otaki).

TRACHUROPS TORVUS (Jenyñs).

Yokohama (Otaki).

CARANX FLAVOCÆRULEUS Schlegel.

Yokohama (*Albatross*).

CARANX EQUULA Temminck and Schlegel.

Yokohama (Otaki).

CARANX LATUS Agassiz.

Yokohama (*Albatross*).

Family LEIOGNATHIDÆ.

LEIOGNATHUS NUCHALE (Temminck and Schlegel).

Yokohama (*Albatross*).

LEIOGNATHUS RIVULATUM (Temminck and Schlegel).

Yokohama (Otaki).

Family CORYPHÆNIDÆ.

CORYPHÆNA HIPPURUS Linnæus.

(*Coryphæna japonica* Temminck and Schlegel.)

Tokyo (Otaki).

Family STROMATEIDÆ.

PSENOPSIS ANOMALUS (Temminck and Schlegel).

Tokyo (Otaki).

Family CHEILODIPTERIDÆ.

APOGON LINEATUS Temminck and Schlegel.

Yokohama (Otaki).

APOGON QUADRIFASCIATUS Valenciennes.

Tokyo (*Albatross*).

MALAKICHTHYS GRISEUS Döderlein.

Tokyo (Otaki).

SCOMBROPS CHEILODIPTEROIDES Bleeker.

Tokyo (Otaki; *Albatross*).

Family SERRANIDÆ.

LATEOLABRAX JAPONICUS Cuvier and Valenciennes.

Tokyo (Otaki; *Albatross*).

NIPHON SPINOSUS Cuvier and Valenciennes.

Tokyo (Otaki).

BRYTTOSUS Jordan and Snyder, new genus.

This genus is allied to *Siniperca*, but with deeper body, much larger cycloid scales, no true canines, and many fine antrorse teeth on the preopercle. The black flap on the opercle suggests that seen in *Lepomis* (*Bryttus*), a group of which may be descended from relatives of *Siniperca* and *Bryttosus*.

BRYTTOSUS KAWAMEBARI Temminck and Schlegel.

(Plate XII.)

Yanagawa River (Bay of Shimibara) (Ishikawa).

LABRACOPSIS JAPONICUS Döderlein.

Tokyo (Otaki).

MEGAPERCA ISCHINAGI Hilgendorf.

Tokyo (Otaki).

EPINEPHELUS FASCIATUS (Forskål).

Tokyo (Otaki).

EPINEPHELUS AKAARA (Temminck and Schlegel).

Tokyo (Otaki).

EPINEPHELUS LATIFASCIATUS (Temminck and Schlegel).

Yokohama (*Albatross*).

EPINEPHELUS SEPTEMFASCIATUS Thunberg.

(*Serranus octocinctus* Temminck and Schlegel.)
(*Plectropoma susuki* Cuvier and Valenciennes.)

Tokyo (Otaki).

EPINEPHELUS TRIMACULATUS (Cuvier and Valenciennes).

(*Serranus ura* (Cuvier and Valenciennes)).

Tokyo (Otaki).

[1] CAPRODON SCHLEGELI Günther.

Tokyo (Otaki).

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[1] *Eteliscus* Jordan and Snyder is a new genus based on *Etelis berycoides* Hilgendorf. This genus is somewhat allied to *Anthias*, from which it differs in the short dorsal (D. IX, 10) and low fins.

Family LUTIANIDÆ.

LUTIANUS RUSSELLI (Bleeker).

Tokyo (Otaki).

ETELISCUS Jordan and Snyder, new genus.

The genus *Eteliscus* Jordan and Snyder, differs from *Etelis* in having an opercular spine, as well as in other characters. It is not closely allied to *Etelis* and its affinities may be with the Serranidæ rather than the Lutianidæ.

ETELISCUS BERYCOIDES (Hilgendorf).

Tokyo (Otaki).

NEMIPTERUS SINENSIS Lacépède.

(*Dentex setigerus* Cuvier and Valenciennes.)

Yokohama (*Albatross*).

Family HÆMULIDÆ.

THERAPON OXYRHYNCHUS Temminck and Schlegel.

Tokyo (Otaki).

PARAPRISTOPOMA TRILINEATUM (Thunberg).

Tokyo (Otaki).

PLECTORHYNCHUS CINCTUS (Temminck and Schlegel).

Yokohama (*Albatross*).

Family SPARIDÆ.

PAGRUS MAJOR (Temminck and Schlegel).

Tokyo (Otaki).

PAGRUS CARDINALIS (Lacépède).

Tokyo (Otaki).

PAGRUS RUBER Döderlein.

Tokyo (Otaki).

SPARUS ARIES (Temminck and Schlegel).

Tokyo (*Albatross*).

SPARUS SCHLEGELI (Bleeker).

(*Chrysophrys hasta* Steindachner; not of Bloch and Schneider.)
(*Sparus datnia* Buchanan-Hamilton.)
(*Chrysophrys longispinus* Temminck and Schlegel.)
(*Chrysophrys xanthopoda* Richardson.)

Tokyo (Otaki).

Family KYPHOSIDÆ.

GIRELLA PUNCTATA Gray.

(*Girella melanichthys* (Richardson)).

Tokyo (Otaki).

Family SCIÆNIDÆ.

CORVULA SCHLEGELI (Bleeker).

Tokyo (Otaki).

PSEUDOTOLITHUS MITSUKURII Jordan and Snyder, new species.

(Plate XIII.)

Type.—No. 49407, U.S.N.M.

Locality.—Bay of Tokyo, Japan. Collector, *Albatross.*

Description.—Head, 3⅔ in length; depth, 3⅖; depth of caudal peduncle, 2¾ in head; eye, 5; snout, 3½; maxillary, 2⅖; interorbital space, 3¼; height of longest dorsal spine, 1¾; longest ray, 2¼; anal spine, 2⅛; ray, 1¾; length of pectorals, 1½; ventrals, 1⅓; caudal, 1⅕; number of dorsal spines, 11; rays, 28; anal spines, 2; rays, 7; pectoral rays, 16; scales in lateral line, 50; between lateral line and spinous dorsal, 9.

Dorsal outline not greatly arched; the curve from snout to caudal peduncle even; curve of ventral contour similar to that of dorsal. Snout bluntly rounded; lips thin, the upper with a slight incision on each side of snout; distance between the slits equal to two times the diameter of orbit; symphysis of lower jaw with 4 pores, the outer 2 of which are about as far apart as the incisions of upper lip. Lower jaw slightly included; mouth oblique; edge of premaxillary curved; maxillary reaching a vertical from posterior edge of pupil. Teeth of upper jaw in 2 series; the outer ones small; sharp; not close together; the inner ones minute; in 2 or 3 rows; teeth of lower jaw very small; in a single row, except at symphysis, where there is a narrow patch; an inside row is indicated by a few scattered, very minute teeth. Diameter of eye less than length of snout; contained a little less than two times in interorbital width. Gill-rakers, 7 + 13; slender; length of longest, two times the diameter of eye. Edge of preopercle with a few short, slender, sharp spines; those on the angle about as large as teeth of upper jaw; not projecting downward. Lateral line arched; following dorsal contour to a point above anal spines, from which it runs straight along middle of caudal peduncle. Scales ctenoid; those on anterior and lower part of head and on fins smooth; a row along base of soft dorsal; none on spinous dorsal; a single row extending on caudal along lateral line to end of fin; pectorals and anal naked; a few scales on ventrals. Dorsal fins connected; first dorsal spine just projecting above scales; third and fourth spines highest; others rapidly decreasing in height to the ninth; the latter, together with the tenth and eleventh, much shorter than the rays which follow; rays, all except the last 3, of about equal height. First anal spine minute; second stout; short. Pectorals and ventrals pointed; the last ray of the latter with a filament which projects beyond edge of fin a distance equal to one-half the diameter of eye. Color in alcohol, silvery; darker above than below; a continuous, dark line, equal in width to about one-half the diameter of pupil on each row of scales; those on the dorsal anterior part of body run obliquely; those on the posterior and lateral parts horizontally, the transition from oblique to horizontal being gradual; ventrally the lines become indistinct and disappear; a small dark spot on upper posterior part of base of pectoral; dorsal, anal, and caudal fins dusky.

But one specimen was collected, measurements of which are here given: Length of body, 171 mm.; length of head, expressed in hundredths of body, 28; depth of body, 30; distance from snout to dorsal, 34; distance from snout to anal, 71; depth of caudal peduncle, 10; length of snout, 7; length of maxillary, 12; diameter of eye, 6; width of interorbital space, 8; length of base of spinous dorsal, 20; length of base of soft dorsal, 43; length of second dorsal spine, 12; third dorsal spine, 15; length of longest dorsal ray, 12½; length of base of anal, 8½; length of first spine, 2; second spine, 12; length of first ray, 16; length of longest pectoral ray, 20; ventral, 21; caudal, 22.

The species is named in honor of Dr. Kakichi Mitsukuri, of the Imperial University of Tokyo.

Family MÆNIDÆ.

EMMELICHTHYS SCHLEGELII Richardson.

Tokyo (Otaki).

Family OPLEGNATHIDÆ.

OPLEGNATHUS FASCIATUS (Temminck and Schlegel).

Tokyo (Otaki); Hakodate (*Albatross*).

OPLEGNATHUS PUNCTATUS Temminck and Schlegel.

Yokohama (*Albatross*).

Family PENTACEROTIDÆ.

ANOPLUS BANJOS Richardson.

(*Banjos typus* Bleeker.)

Tokyo (Otaki).

Family PRIACANTHIDÆ.

PRIACANTHUS MACRACANTHUS Cuvier and Valenciennes.

(*Priacanthus benmebari* Schlegel).

Tokyo (Otaki).

PRIACANTHUS BOOPS (Forster).

(*Priacanthus supraarmatus* Hilgendorf.)
(*Priacanthus japonicus* Cuvier and Valenciennes.)

Tokyo (Otaki).

PSEUDOPRIACANTHUS NIPHONIUS (Cuvier and Valenciennes).

(*Priacanthus meyeri* Günther.)

Tokyo (Otaki).

Family MULLIDÆ.

UPENEOIDES JAPONICUS (Houtuyn).

(*Upeneus bensasi* Temminck and Schlegel.)

(Otaki.)

Family CIRRHITIDÆ.

CHEILODACTYLUS ZONATUS Cuvier and Valenciennes.

Tokyo (Otaki).

Family POLYNEMIDÆ.

POLYDACTYLUS PLEBEIUS (Broussonet).

Tokyo (Otaki).

Family EMBIOTOCIDÆ.

EMBIOTOCA SMITTI (Nystrom).

Yokohama (*Albatross*).

DITREMA TEMMINCKII Bleeker.

(*Ditrema læve* Günther.)

Tokyo (Otaki; *Albatross*).

Family POMACENTRIDÆ.

CHROMIS NOTATUS Temminck and Schlegel.

Tokyo (Otaki).

Family LABRIDÆ.

CHŒROPS JAPONICUS Cuvier and Valenciennes.

Tokyo (Otaki).

SEMICOSSYPHUS ROBECCHII Steindachner and Döderlein.

Tokyo (Otaki).

DIASTODON UNIMACULATUS Günther.

(*Cossyphus oxycephalus* Bleeker.)

Tokyo (Otaki).

PSEUDOLABRUS EOTHINUS (Richardson).

(*Labrus rubiginosus* Temminck and Schlegel, not of Richardson; the name preoccupied.)

Tokyo (Otaki).

DUYMÆRIA JAPONICA Bleeker.

(*Ctenolabrus flagellifer* Temminck and Schlegel, not of Cuvier and Valenciennes.)
(*Crenilabrus spilogaster* Bleeker.)

Tokyo (Otaki).

HALICHŒRES PYRRHOGRAMMUS (Temminck and Schlegel).

Tokyo (Otaki; *Albatross*).

HALICHŒRES BLEEKERI (Steindachner and Döderlein).

Tokyo (Otaki).

HALICHŒRES PŒCILOPTERUS (Temminck and Schlegel).

Tokyo (Otaki).

Family SCARIDÆ.

CALOTOMUS JAPONICUS (Cuvier).

Tokyo (Otaki).

Family ZEIDÆ.

ZEUS JAPONICUS Cuvier and Valenciennes.

Tokyo (Otaki).

ZENOPSIS NEBULOSUS (Temminck and Schlegel).

Tokyo (Otaki).

Family ANTIGONIIDÆ.

ANTIGONIA RUBESCENS (Temminck and Schlegel).

(? *Antigonia capros* Lowe.)
(*Hypsinotus benhatatate* Bleeker.)

Tokyo (Otaki).

Family TEUTHIDIDÆ.

PRIONURUS SCALPRUM Langsdorf.

Tokyo (Otaki).

Family SIGANIDÆ.

SIGANUS FUSCESCENS (Houttyn).

(*Amphacanthus aurantiacus* Temminck and Schlegel.)

Tokyo (Otaki).

SIGANUS ALBOPUNCTATUS (Temminck and Schlegel).

Tokyo (Otaki).

Family MONACANTHIDÆ.

MONACANTHUS CIRRIFER Temminck and Schlegel.

(*Monacanthus komuki* (Bleeker).)

Tokyo (Otaki).

PSEUDOMONACANTHUS MODESTUS (Günther).

Tokyo (Otaki); Hakodate (*Albatross*).

PSEUDOMONACANTHUS TRACHYDERMA (Bleeker).

Yokohama (Otaki).

Family OSTRACIIDÆ.

ARACANA ACULEATA (Houttyn).

Tokyo (Otaki).

Family TETRAODONTIDÆ.

LAGOCEPHALUS ALBOPLUMBEUS Richardson.

(*Tetraodon pœcilonotus* Temminck and Schlegel.)
(*Tetraodon niveatus* Brevoort.)

Tokyo (Otaki).

LAGOCEPHALUS BIMACULATUS (Richardson).

Tokyo (Otaki).

LAGOCEPHALUS RUBRIPES (Temminck and Schlegel).

(*Lagocephalus xanthopterus* Temminck and Schlegel.)

Tokyo (Otaki).

LAGOCEPHALUS VERMICULARIS (Temminck and Schlegel).

Tokyo (Otaki; *Albatross*).

LAGOCEPHALUS STICTONOTUS (Temminck and Schlegel).

Tokyo (Otaki).

LAGOCEPHALUS PARDALIS (Temminck and Schlegel).

Tokyo (Otaki).

Family DIODONTIDÆ.

CHILOMYCTERUS CALIFORNIENSIS (Eigenmann).

(*Diodon tigrinus* Temminck and Schlegel, not of Cuvier.)

Tokyo (Otaki).

The specimen identified as above agrees very closely with one taken from the Galapagos Islands by Snodgrass and Heller, as also with the original description of Dr. Eigenmann's type from San Pedros, California.

Family SCORPÆNIDÆ.

SEBASTODES INERMIS (Cuvier and Valenciennes).

(*Sebastes ventricosus* Schlegel).

Tokyo (Otaki). Hakodate (*Albatross*).

SEBASTODES JOYNERI (Günther).

Tokyo (Otaki).

SEBASTODES OBLONGUS (Günther).

Tokyo (Otaki; *Albatross*).

SEBASTODES TACZANOWSKI (Steindachner).

Iturup (*Albatross*).

SEBASTODES HAKODATIS Jordan and Snyder, new species.

(Plate XIV.)

Type.—No. 49394, U.S.N.M.

Locality.—Hakodate, Japan. Collector, *Albatross*.

Description.—Head, measured to end of opercular flap, 2⅔ in length; depth, 2⅘; depth of caudal peduncle, 3⅗ in head; eye, 4⅖; snout, 4; maxillary, 2⅖; interorbital space, 4½; height of longest dorsal spine, 2⅔; longest ray, 2⅗; anal spine, 3⅕; ray, 2⅕; length of pectorals, 4 in length; ventrals, 5; caudal, 4½; number dorsal spines, 13; rays, 12; anal spines, 3; rays, 7; pectoral rays, 10–8; scales in lateral line, 54; pores, 46.

Eye moderate in size; nearer tip of snout than to posterior edge of opercle, a distance equal to its diameter. Snout equal in length to diameter of eye. Lower jaw projecting; symphysial knob scarcely noticeable. Maxillary extending to a vertical through posterior edge of orbit. Bands of teeth on jaws, palatines, and vomer; palatine bands as wide as those on lower jaws. Gill-rakers, 6–17; those on upper part of arch short and blunt; others long and slender. Interorbital space a little convex; interorbital ridges very low, rounded. Head not strongly armed, the spines all lying close to the surface; nasal, preocular, postocular, and tympanic spines minute, sharp; occipital ridges low, rounded, terminating in small, acute spines; preorbital with three flat, sharp spines which project downward; preopercle with five flat, rather blunt spines; two opercular and two humeral spines present. Preorbital area, maxillary, lower jaw, and branchiostegals naked; subopercle and lower and posterior edges of preopercle with cycloid scales; other parts of head with small ctenoid scales; those of the interorbital area extending forward to nasal spines; breast and belly with cycloid scales; other parts of body with ctenoid scales, the edges of which have minute bristles; most of body with minute accessory scales wedged in between the larger ones; spinous dorsal, except a small space on posterior ventral part, naked; other fins with minute scales, which are closely packed at the bases, extending outward along the membranes. Dorsal fins continuous, though having a dividing notch; inter-spinous membranes deeply incised; first and twelfth spines contained three and one-third times in length of maxillary; fourth to seventh spines longest; tenth and thirteenth spines of equal length; second and third dorsal rays longest. Anal fin rounded, first spine a little less than one-half the length of second; second and third spines of equal length, the second much stronger. Pectoral rounded, the lower eight rays simple. Ventrals pointed when depressed. Edge of caudal slightly convex. Color, in alcohol, dark, with scarcely noticeable irregular blotches on upper parts; fins broadly edged with darker color; an indistinct light band on pectoral.

A number of smaller specimens (co-types No. 6274, Leland Stanford Junior Univ. Mus.), from the same locality as the type, are much lighter in color, with small, irregular brown spots scattered over the body. In many individuals the spots are collected together, forming four or five indistinct lateral bands; all have three or four dark lateral bands radiating downward and backward from the orbit. The fins show more or less dark color, the pectoral and caudal often being distinctly barred.

Measurements of Sebastodes hakodatis.

Length of body in millimeters	196	82	84	86	79	79	75	70	66	66
Length of head in body	.37	.36	.35	.36	.35	.36	.36	.36	.37	.37
Depth of body	.38	.37	.37	.36	.36	.37	.34	.36	.33	.37
Distance from snout to dorsal	.36	.34	.33	.34	.34	.34	.33	.34	.35	.34
Distance from snout to anal	.75	.76	.74	.77	.76	.73	.76	.79	.74	.76
Depth of caudal peduncle	.12	.10	.10	.10	.10	.10	.11	.10	.10	.10
Length of caudal peduncle	.20	.17	.16	.16	.17	.17	.15	.19	.17	.16
Length of snout	.08	.09	.085	.09	.09	.09	.09	.10	.09	.09
Length of maxillary	.17	.18	.16	.17	.16	.165	.17	.17	.17	.17
Diameter of eye	.09	.085	.09	.09	.095	.10	.10	.10	.10	.105
Width of interorbital space	.09	.07	.07	.07	.07	.07	.07	.07	.07	.065
Length of base of spinous dorsal	.40	.38	.39	.39	.40	.39	.37	.36	.39	.39
Length of base of soft dorsal	.20	.22	.22	.23	.23	.23	.22	.22	.22	.19
Length of first dorsal spine	.05	.06	.07	.07	.07	.07	.07	.07	.08	.08
Length of fourth dorsal spine	.13	.17	.17	.14	.16	.17	.16	.16	.17	.16
Length of thirteenth dorsal spine	.09	.10	.09	.10	.12	.11	.10	.10	.10	.12
Length of third dorsal ray	.17	.17	.17	.18	.19	.19	.18	.18	.17	.17
Length of base of anal	.16	.16	.165	.16	.16	.16	.16	.14	.15	.15
Length of first anal spine	.06	.07	.06	.075	.08	.07	.085	.07	.07	.08
Length of second anal spine	.12	.14	.15	.15	.15	.15	.165	.14	.15	.15
Length of third anal spine	.12	.14	.14	.14	.15	.14	.15	.14	.15	.15
Length of second anal ray	.21	.19	.20	.19	.19	.19	.19	.17	.20	.18
Length of longest pectoral ray	.26	.26	.26	.27	.27	.27	.27	.28	.27	.28
Length of longest ventral ray	.21	.21	.22	.23	.21	.23	.22	.20	.22	.19
Length of caudal	.23	.23	.22	.23	.22	.23	.23	.21	.23	.24
Number of dorsal rays	12	12	12	12	12	13	12	12	12	12
Number of anal rays	7	7	7	7	7	7	7	7	7	7
Number of pectoral rays	18	18	18	18	18	18	18	18	18	18
Number of pores in lateral line	46	44	49	50	46	46	45	49	45	45

SEBASTODES SCYTHROPUS Jordan and Snyder, new species.

(Plate XV.)

Type.—No. 49406, U.S.N.M.

Locality.—Misaki, near Tokyo, Japan. Collector, K. Otaki.

Description.—Head, measured to end of opercular flap, 2⅗ in length; depth, 2½; depth of caudal peduncle, 3½ in head; eye, 2⅗; snout, 5; maxillary, 2½; interorbital space, 4⅓; height of longest dorsal spine, 2⅕; longest ray, 2⅔; anal spine, 2⅗, ray, 2⅕; pectoral, 3⅙ in length; ventrals, 4½; caudal, 4¾; number of dorsal spines, 13; rays, 13; anal spines, 3; rays, 6; pectoral rays, 8+8; scales in lateral line, 31; pores, 28.

Eye very large; round; high in head; nearer tip of snout than to posterior edge of opercle, a distance equal to interorbital width. Interorbital area convex; with a median longitudinal groove, deepest anteriorly, growing shallower and wider posteriorly; the groove bounded laterally by a pair of low, rounded ridges. Mouth, oblique; maxillary extending to a vertical through a point a little posterior to center of pupil; lower jaw with a slender, symphyseal knob which projects in a line with upper contour of head. Teeth on jaws, vomer and palatines; symphyseal patch of teeth of lower jaw elevated, fitting into a median toothless notch of the upper jaw; palatine bands narrow. Gill-rakers long and slender; 10+24 on first arch. Head strongly armed; preocular, postocular, and occipital spines large and sharp; preceded by prominent ridges; tympanic spine, acute; smaller than postocular; nasal spines well developed; preorbital with 2 strong spines directed downward; above these an indistinct lobe; preopercle with 5 large spines; the upper 3, of which the second is longest, project backward; the lower 2 project downward and backward; a subopercular and an interopercular spine closely approximated; 2 large, flat, acute spines on upper part of opercle; 2 small, humeral spines. Head completely scaled; lower jaw, maxillary, and preorbital area with very small scales; dorsal, anal, caudal, and ventral fins with small scales extending almost to tips of spines and rays; pectorals less extensively scaled; all the scales except those on fins and branchiostegals ctenoid. First dorsal spine shortest; equal in length to width of interorbital space; second equal in length to ninth and tenth; third to sixth twice as long as first; interspinal membranes deeply incised. Longest dorsal rays as long as third spine. First anal spine a little less than half as long as second, somewhat more than half as long as third; second spine strong. Edge of caudal concave; 8 lowermost rays of pectoral simple; uppermost simple ray, in middle of fin, longest, extending to a vertical through insertion of anal. Ventrals extending to vent. Color, in alcohol, light, with brownish, cloud-like blotches of irregular shape, a blotch equal in width to half the diameter of orbit extending from insertion of dorsal downward to lower edge of interopercle, the brownish color darker on upper part of opercle; a patch of dark color on upper median part of body, spreading over posterior two-thirds of spinous dorsal, extending posteriorly below base of soft dorsal, and reaching upward on anterior part of the latter fin; a dark band on posterior dorsal part of caudal peduncle.

A larger specimen (cotype No. 6271, Leland Stanford Junior University collection) differs in no particular from the one described.

Measurements of Sebastodes scythropus.

Length of body in millimeters	150	130
Length of head in body	37	37
Depth of body	41	40
Distance from snout to dorsal	38	38
Distance from snout to anal	73	73
Depth of caudal peduncle	11	11
Length of caudal peduncle	18	19
Length of snout	8	8
Length of maxillary	16½	17
Diameter of eye	15	14
Width of interorbital space	9	8½
Length of base of spinous dorsal	44	44
Length of base of soft dorsal	21	21
Length of first dorsal spine	8	8
Length of fourth dorsal spine	17	19
Length of thirteenth dorsal spine	11	12
Length of third dorsal ray	15	12
Length of base of anal	15	17
Length of first anal spine	8	9
Length of second anal spine	18	19
Length of third anal spine	15	16
Length of second anal ray	17	18
Length of longest pectoral ray	33	32
Length of longest ventral ray	23	23
Length of caudal	23	25
Number of dorsal rays	12	18
Number of anal rays	6	6
Number of pectoral rays	16	16
Number of pores in lateral line	28	27

SEBASTODES PACHYCEPHALUS (Temminck and Schlegel).

Misaki (Otaki).

HELICOLENUS MARMORATUS (Cuvier and Valenciennes).

Hakodate (*Albatross*). Tokyo (Otaki).

HELICOLENUS ALBAFASCIATUS (Lacépède).

Probably distinct from *H. dactylopterus*, a common species of the Mediterranean, although very closely related.

Misaki (Otaki).

SCORPÆNA FIMBRIATA Döderlein.

Tokyo (Otaki).

SCORPÆNA ONARIA Jordan and Snyder, new species.

(Plate XVI.)

(*Scorpæna neglecta* Temminck and Schlegel, not of Heckel.)

Type.—Specimen No. 49405, U.S.N.M.

Locality.—Misaki, Japan. Collector, K. Otaki.

Description.—Head, measured to end of opercular flap, 2⅛ in length; depth of caudal peduncle, 4½ in head; eye, 4; snout, 4; maxillary, 2; interorbital space, 7½; height of longest dorsal spine, 2½; longest ray, 2½; anal spine, 2¾, ray, 2½; pectorals, 3⅔ in length; ventrals, 4; caudal, 3⅖; number of dorsal spines, 12; rays, 9; anal spines, 3; rays, 5; pectoral rays, 17; scales in lateral line, 30; pores, 21.

Dorsal outline of body angular; its highest point at base of first dorsal spine, from which it slopes anteriorly to tip of snout; posteriorly to end of dorsal fin; caudal peduncle narrow; head very large. Eye large; high in head; two times as far from end of opercular flap as from tip of snout. Jaws equal; the symphysial knob of lower jaw projecting. Maxillary extending to a vertical through posterior edge of orbit. Bands of teeth on jaws, vomer, and palatines; the vomer and palatine bands narrow. Gillrakers on first arch 5+9; short, blunt, covered with small, sharp spines. Interorbital space deeply concave; interorbital ridges prominent, close together, ending posteriorly in strong spines. Quadrate pit of occiput distinct. No pit between anterior border of eye and suborbital stay. Supraocular tentacle as long as diameter of pupil. Head very strongly armed. Nasal spines slender. Ocular rim with four large, flat spines; the one above the pupil blunt. Tympanic spine present. Preorbital with a strong spine projecting downward; a bifid spine projecting forward; at the base of these a bifid spine projecting outward; of each bifid spine the upper branch is the longer. Suborbital stay with three strong, flat spines. Preopercle with five spines; the upper longest and bifid in line with those of suborbital stay, the lower short and blunt. Opercle with two spines preceded by ridges; two strong occipital spines; two post-temporal spines. Head naked, except upper part of opercular flap and on preopercle; the scales of the latter region large, smooth, embedded, and difficult to detect. Body everywhere with scales, except a small axillary space; those on the upper parts strongly ctenoid; those covered by pectoral fin smooth and more or less embedded; breast and region anterior to base of pectoral with deeply embedded, smooth scales. Along the lateral line and scattered over the head and body are small epidermal flaps. Third dorsal spine longest; contained two and one-half times in head; length of first contained two and one-half in third; fourth spine little if any shorter than third; others gradually shorter to the last, which equals the eighth in length. Edge of soft dorsal rounded; longest rays 2½ in head. Second anal spine much stronger than others; longest; 3 in head; first spine one-half as long as second. First ray longest; 2½ in head. Edge of caudal rounded. First uppermost and 10 lower rays of pectoral simple, the lower ones covered with thick skin. Ventral rays reaching a little beyond tips of pectorals. Color in alcohol, light, clouded above with darker; a few small dark spots scattered over the body and fins, except ventrals; an elongate dark blotch on upper part of spinous dorsal, between fifth and tenth spines.

Two other specimens (cotypes, No. 6275, Leland Stanford Junior Univ. Mus.), which differ slightly from the one described, were collected. One has a much smaller blotch on the spinous dorsal, and the small spots on the body are more distinct. The other has no spots on the fins.

Scorpæna onaria resembles *S. fimbriata* in general appearance. The former has a much larger and more strongly armed head, larger eye and mouth, and higher dorsal spines.

Measurements of Scorpæna onaria.

Length of body in mm	159	145	135
Length of head in body	46	46	46
Depth of body	38	40	38
Distance from snout to dorsal	43	43	42
Distance from snout to anal	78	76	76
Depth of caudal peduncle	11	10	11
Length of snout	13	12	13
Length of maxillary	23	23	24
Diameter of eye	13	15	13
Width of interorbital space	6½	5	6
Length of base of spinous dorsal	41	44	43
Length of base of soft dorsal	15	21	16½
Length of first dorsal spine	8	10	10
Length of third dorsal spine	20	17	22
Length of longest dorsal ray	19	19	21
Length of base of anal	14	13	15
Length of first anal spine	8½	9	10
Length of second anal spine	17	18	17
Length of third anal spine	14	15	16
Length of longest anal ray	20	20	20
Length of longest pectoral ray	26	27	28
Length of longest ventral ray	24	23	23
Length of caudal	28	28	30
Number of dorsal rays	10	11	9
Number of anal rays	5	5	5
Number of pectoral rays	17	17	17
Number of pores in lateral line	21	22	23
Number of scales above lateral line to base of fifth spine	8	8	7

COCOTROPUS POTTII Steindachner.

Tokyo (Otaki).

PTEROIS LUNULATA Temminck and Schlegel.

Tokyo (Otaki).

TETRAROGE LONGISPINIS Cuvier and Valenciennes.

Tokyo (Otaki).

PELOR JAPONICUM Cuvier and Valenciennes.

Tokyo (Otaki).

Family HEXAGRAMMIDÆ.

HEXAGRAMMOS SUPERCILIOSUS (Pallas).

Iturup Island (*Albatross*).

HEXAGRAMMOS OTAKII Jordan and Starks.

(*Labrax hexagrammus* Temminck and Schlegel; not of Pallas).

Tokyo (Otaki).

HEXAGRAMMOS OCTOGRAMMUS (Pallas).

(*Chirus ordinatus* Cope.)

Iturup Island; Robben Island (*Albatross*).

HEXAGRAMMOS LAGOCEPHALUS (Pallas).

Bering Island; Iturup Island (*Albatross*).

AGRAMMUS AGRAMMUS (Temminck and Schlegel).

(*Agrammus schlegeli* Günther.)

Tokyo (Otaki).

Family COTTIDÆ.

ARCHISTES PLUMARIUS Jordan and Gilbert.

Ushishir Island (*Albatross*).

PSEUDOBLENNIUS PERCOIDES Günther.

(*Pseudoblennius anahaze* Bleeker.)

Tokyo (Otaki).

PSEUDOBLENNIUS COTTOIDES (Richardson).

(*Centridermichthys marmoratus and C. elegans* Steindachner.)

Yokohama (*Albatross*).

PODABRUS CENTROPOMUS (Richardson).

Misaki (Otaki).

MYOXOCEPHALUS STELLERI Tilesius.

(*Cottus decastrensis* Kner.)

Hakodate (*Albatross*).

ARGYROCOTTUS ZANDERI Herzenstein.

Iturup Island (*Albatross*).

Family PLATYCEPHALIDÆ.

PLATYCEPHALUS INDICUS (Linnæus).

(*Platycephalus insidiator* Forskål.)

Tokyo (Otaki).

PLATYCEPHALUS CROCODILUS Tilesius.

(*Platycephalus guttatus* Cuvier and Valenciennes.)

Tokyo (Otaki).

INSIDIATOR Jordan and Snyder, new genus.

Insidiator (type, *rudis*) differs from *Platycephalus* in having 3 preopercular spines instead of 2, and in the larger scales and rougher head.

INSIDIATOR RUDIS (Günther).

Tokyo (Otaki).

Family AGONIDÆ.

PERCIS JAPONICUS (Pallas).

(*Agonus stegophthalmus* Tilesius.)

Robben Island (*Albatross*).

BRACHYOPSIS ROSTRATUS (Tilesius).

Iturup Island (*Albatross*).

PALLASINA BARBATA (Steindachner).

Iturup Island (*Albatross*).

PODOTHECUS HAMLINI Jordan and Gilbert.

Shana Bay, Iturup Island (*Albatross*).

PODOTHECUS THOMPSONI Jordan and Gilbert.

Shana Bay, Iturup Island (*Albatross*).

Family LIPARIDIDÆ.

LIPARIS AGASSIZII Putnam.

Hakodate (*Albatross*).

Family TRIGLIDÆ.

CHELIDONICHTHYS KUMU (Lesson and Garnot).

Tokyo (Otaki).

LEPIDOTRIGLA LONGISPINIS Steindachner.

Tokyo (Otaki).

LEPIDOTRIGLA MICROPTERA Günther.

(*Lepidotrigla strauchii* Steindachner.)

Tokyo (Otaki).

Family TRICHODONTIDÆ.

ARCTOSCOPUS JAPONICUS Steindachner.

Iturup Island (*Albatross*).

Family TRACHINIDÆ.

NEOPERCIS MULTIFASCIATA Döderlein.

Tokyo (Otaki).

PARAPERCIS SEXFASCIATA (Temminck and Schlegel).

Tokyo (*Albatross*).

Family SILLAGINIDÆ.

SILLAGO JAPONICA (Temminck and Schlegel).

Tokyo (Otaki; *Albatross*).

Family MALACANTHIDÆ.

LATILUS SINENSIS Lacépède.

(*Latilus argentatus* Cuvier and Valenciennes.)

Tokyo (Otaki; *Albatross*).

Family URANOSCOPIDÆ.

URANOSCOPUS ASPER Temminck and Schlegel.

Tokyo (Otaki; *Albatross*).

Family CALLIONYMIDÆ.

CALLIONYMUS JAPONICUS Houttuyn.

(*Callionymus longicaudatus* and *C. variegatus* Temminck and Schlegel.)

Yokohama (Otaki).

CALLIONYMUS RICHARDSONII (Bleeker).

Tokyo (Otaki).

CALLIONYMUS CURVICORNIS Cuvier and Valenciennes.

(*Callionymus valenciennei* Temminck and Schlegel.)
(? *Callionymus inframundus* Gill.)

Yokohama (Otaki).

CALLIONYMUS BENITEGURI Jordan and Snyder, new species.

(Plate XVII.)

A *Callionymus* which we are unable to identify with any known species differs markedly from *C. curvicornis* and *C. japonicus* in having a less pointed snout and a much wider interorbital space. We here describe it as *Callionymus beniteguri*, new species.

Type.—No. 49402, U.S.N.M. From Bay of Tokyo, Japan. Collected by K. Otaki.

Description.—Head, 3¾ in body; depth, 2½ in head; snout, 2½; orbit, 4⅗; interorbital space, 9; maxillary, 2⅘; first dorsal spine, 2½; ray, 1½; last dorsal ray, 4⅖ in body; first anal ray, 10½; last anal ray, 6½; length of pectoral, 5; ventral, 4⅙; caudal, 2⅕; number of dorsal spines, 4; rays, 9; anal rays, 9; pectoral rays, 20.

Body much depressed; snout, viewed from the side, acute; from above, sharply rounded. Upper rim of orbit projecting above dorsal contour of head; interorbital space deeply convex. Eye nearer gill-opening than tip of snout, a distance equal to its longitudinal diameter. Upper jaw projecting a little beyond the lower, maxillary excessively protractile, its posterior end falling short of a perpendicular through anterior edge of orbit, a distance equal to interorbital space. Lips extending laterally as flaps, which unite on each side below the middle of maxillary. Teeth of jaws in narrow villiform bands. Distance between gill-openings equal to length of snout; width of spiracle equal to one-half the diameter of eye. Preopercular spine prominent; posterior end with three large teeth, the first projecting backward; the third projecting upward; a minute tooth proximal to the third; basal part of spine with a tooth equal in size to the first, which projects forward; all the teeth covered with skin, so that only their tips project. Lateral lines extending, one on each side of body and on caudal fin; connected by a loop over posterior part of caudal peduncle, and by a similar one across the occiput; continuing forward from occipital region a bifid branch is sent downward toward the preopercular spine; a similar branch passes downward from posterior edge of orbit. Parietals each with an elevated knob with minute ridges radiating from the center. Dorsal spines weak; the first longest, with a short filament; second spine shorter, its base close to that of first; third and fourth spines farther apart, the fourth one-half as long as third. Dorsal rays simple, except the last, which is double, branched, and longer than the others. Anal inserted on a vertical passing half way between second and third dorsal rays; next to last anal ray directly below last dorsal ray; other rays similar in shape to those of dorsal, except that they are shorter. Both dorsal and anal, when folded, reaching base of caudal; the dorsal somewhat the longer. Pectoral pointed, upper edge a little concave; the lower convex; all the rays, except the uppermost and the lowermost, branched. Ventral rays, each with about nine branches, the filamentous tips of which project a little beyond edge of fin; membrane of fin attached posteriorly to middle of base of pectoral. Caudal rounded posteriorly. Color, in alcohol, upper parts brownish with many round and oblong whitish spots, having somewhat darker borders; a row of larger spots along the lateral line; under parts, anterior to anal fin, dead white; in the region of anal yellowish. Dorsal and caudal fins with dark-bordered white spots, among which are scattered brown spots of about the same size; spinous dorsal with a linear dark edge; three lower interradial membranes of caudal brownish, without spots.

The type is a female, 185 mm. long. Other females (cotypes, No. 6278, Leland Stanford Junior University) closely resemble the type. There is some variation in the size of the teeth on the preopercular spine, and one of them is sometimes absent. On the dorsal and caudal fins the spots are arranged in more or less definite rows; longitudinally on the dorsal; transversely on the caudal. A male specimen is darker both above and below, the spots on head and body being small and indistinct. The caudal has many large, oval, brown spots on a background marbled with white and brown. The anal is dusky, with whitish crossbars on the membranes. The first two dorsal spines are broken off just above the edge of the fin. Their size at the broken place indicates that they were much longer. The third spine has a short filament.

Family GOBIIDÆ.

ODONTOBUTIS OBSCURUS (Temminck and Schlegel).

Yokohama (Otaki).

ELEOTRIS OXYCEPHALA (Temminck and Schlegel).

Laka Biwa (Otaki).

ACENTROGOBIUS GYMNAUCHEN (Bleeker).

Tokyo (Otaki; Kishinouye).

ACENTROGOBIUS PFLAUMI Bleeker.

Tokyo (Kishinouye).

ABOMA LACTIPES (Hilgendorf).

Tokyo (Otaki); Tone River (Kishinouye).

CHÆNOGOBIUS CASTANEUS (O'Shaughnessy).

Tokyo (Otaki); Laka Biwa (Ishikawa).

CHÆNOGOBIUS MACROGNATHOS (Bleeker).

Lake Biwa (Ishikawa; Kishinouye).

In some of our specimens from Lake Biwa the maxillary scarcely reaches the eye posteriorly, while in others it extends far past, as figured by Bleeker. The lower jaw projects slightly beyond the upper. Some individuals show scarcely a trace of dark color; others have minute dark dots grouped close together, forming reticulations on the upper parts of the body. The caudal fin has 4 dark vertical bands.

The head and nape, as far back as the thin ventral wall of the abdomen, naked; other parts of body with small scales, 52 to 60 in a lateral series. Described by Bleeker as scaleless.

Dr. Van Lidth de Jeude, of the University of Leyden, kindly sends us the following note concerning Bleeker's type in the Leyden museum:

> I am rather inclined to think that the specimen must have had small scales * * *. A careful microscopical examination exhibited on some parts of the body scale-pouches about 0.28 mm. wide, and after softly stroking the tail end with a small scalpel I succeeded in loosening a small scale about 0.25 mm. wide.

Dr. Van Lidth de Jeude also adds that it is possible that the scale may have adhered to the specimen examined as a result of contact with some other species.

GOBIUS SIMILIS (Gill).

(*Rhinogobius similis* Gill.)

Ishikawa-Ken (Kishinouye).

CHÆTURICHTHYS HEXANEMUS (Bleeker).

Lake Biwa (Ishikawa).

TRIÆNOPHORICHTHYS SQUAMISTRIGATUS (Hilgendorf).

Tone River; Ishikawa-Ken (Kishinouye).

TRIFISSUS Jordan and Snyder, new genus.

The genus *Trifissus* differs from *Triænophorichthys* in having canine teeth, one on each side of the lower jaw posteriorly.

Diagnosis of *Trifissus* new genus.

Type, *Trifissus ioturus*, new species.

Body rather elongate; caudal peduncle, deep; head wide; snout blunt; mouth somewhat oblique; premaxillary extending to a vertical through anterior edge of pupil; jaws equal, with a row of movable, trilobed teeth, followed by small, simple ones; lower jaw with a distinct, curved canine on each side, posterior to the trilobed teeth. Body with small ctenoid scales; nape and posterior part of head with scales; interorbital area, snout, cheeks, and under part of head naked. Dorsal fins not connected, the first with six spines. Ventrals united, free from belly.

TRIFISSUS IOTURUS Jordan and Snyder, new species.

(Plate XVIII.)

Type.—No. 49403, U.S.N.M.

Locality.—Bay of Tokyo, Japan. Collector, K. Kishinouye. Japanese name, *Shimahaze* (striped goby).

Description.—Head, 3⅖ in length; depth, 4⅛; depth of caudal peduncle, 6⅕; eye, 4 in head; snout, 4⅔; interorbital space, 8; height of longest dorsal spine, 7 in length, ray, 7; longest anal ray 7½; length of pectorals, 3½; ventrals, 4⅔; caudal, 4½; number of dorsal spines, 6; rays, 13; anal, 12; scales in lateral series, 54; in transverse series, between origin of soft dorsal and anal.

Head wide and flat, its width contained one and a half times in its length; interorbital space, convex. Snout blunt. Mouth slightly oblique; jaws equal; premaxillary extending to a vertical through anterior edge of pupil; lips thick. Upper jaw with a row of 18 long, flat, trilobed, movable teeth, behind which is a row of small, sharp, simple teeth; lower jaw with 20 trilobed teeth, followed by a narrow band of simple, sharp, curved ones; each side of lower jaw with a small, curved canine. Gill-rakers short, pointed. Body covered with small, ctenoid scales, large posteriorly, smaller anteriorly, extending forward on nape and top of head to within a short distance—about the diameter of pupil—of the edge of orbits; other parts of head naked; without barbels. Dorsal fins not connected; third spine longest; others gradually shorter; rays, except first and last, of about the same length. First ray of anal short, simple; others gradually longer. Soft dorsal and anal projecting an equal distance posteriorly. Caudal rounded. Pectoral somewhat pointed, extenting posteriorly as far as tip of depressed dorsal. Ventrals not adherent to belly; their length equal to distance from center of pupil to edge of opercle. A dark color-band, equal in width to vertical diameter of pupil, extending from upper edge of eye, along base of dorsal fins to the caudal, where it ends in a distinct, dark spot; a similar band running from tip of snout, through eye, upper edge of base of pectoral and along side of body to a little below middle of base of caudal; an indistinct dark spot on lower part of base of caudal; sides of head with small, light spots; first spine and first ray of dorsal fins with three distinct dark dots; the color extending posteriorly to the membrane; similar spots faintly outlined on the other spines and rays; the membranes with minute, dark dots; edges of fins a little dusky. Anal, with a dark band along the edge. Caudal, with indistinct crossbars. Base of pectoral with a white band.

Besides the type, one other specimen (cotype, No. 6270, Leland Stanford Junior University Museum) was collected. It is a little smaller and has somewhat brighter colors than the type, but differs from it in no other important way.

Measurements of Trifissus ioturus.

Length of body in millimeters	48	43
Length of head in body	.29	.30
Depth of body	.22	.22
Distance from snout to dorsal	.37	.38
Distance from snout to anal	.60	.58
Depth of caudal peduncle	.14	.13
Length of caudal peduncle	.22	.22
Length of snout	.06	.06
Diameter of eye	.07	.07
Width of interorbital space	.03	.04
Length of base of spinous dorsal	.13	.14
Length of base of soft dorsal	.26	.24
Length of longest dorsal spine	.15	.16
Length of longest dorsal ray	.16	.18
Length of base of anal	.18	.18
Length of longest anal ray	.15	.15
Length of pectoral	.25	.23
Length of ventral	.22	.20
Length of caudal	.23	.23
Number of dorsal spines	6	6
Number of dorsal rays	13	13
Number of anal rays	12	12
Number of scales in lateral series	54	....
Number of scales between origin of soft dorsal and anal	16	....

LUCIOGOBIUS GUTTATUS Gill.

Tokyo (Otaki).

Family BLENNIIDÆ.

BLENNIUS YATEBEI Jordan and Snyder, new species.

(Plate XIX.)

The only species of Japanese *Blennius* known to us is represented by a small specimen collected by the *Albatross* near Misaki. It is here described as *Blennius yatebei*, new species.

Type.—No. 49404, U.S.N.M.

Head, 3½ in length; depth, 4¼; depth of caudal peduncle, 3 in head; eye, 4; snout, 3; interorbital space, 10; height of dorsal spines, 9 in length; anal, 9; length of pectoral, 5¼; ventral, 7; caudal, 6; number of dorsal spines, 12; rays, 16; anal rays, 18; pectoral, 14; pores in lateral line, 32. Snout short, blunt, its outline rising abruptly to border of eye. Mouth slightly oblique; jaws subequal; maxillary extending to a vertical through center of pupil; upper lip very wide and thin; a thin fold on each side of lower jaw; the folds not connected at the symphysis. Teeth in a single row on each jaw; curved; incisor-like; closely apposed to each other; their cutting edges rounded; 2 strong, curved canines in each jaw; those of the lower jaw immediately behind the incisor teeth; a small space between upper canines and incisors. Eye oblong; high in head; midway between tip of snout and occiput; upper border of eye with a fringed cirrus, the height of which equals length of snout. Nostril with a flat, branched cirrus. Body naked. Lateral line arched above the pectoral; the pores large anteriorly; becoming indistinct and disappearing on the posterior third of the body. A line of mucous tubes extending from angle of mouth along opercular region to occiput; a set of radiating tubes around lower border of eye. Dorsal extending from occiput to basal rays of caudal; a notch between spinous and soft parts; rays a little higher than spines. Anal preceded by 2 free spines; each with a large, rounded, fleshy pad; posteriorly, the rays gradually become a little higher; membrane of each ray attached a little lower anteriorly than posteriorly, giving the edge of fin a serrated appearance. Caudal paddle shaped; free from both dorsal and anal. Ventrals slender. Pectorals rounded. Color, in spirits, olive brown; dark spots, about the size of pupil, arranged in 3 rows on sides of body; rows of small, dark dots between and below the large ones; the arrangement in rows rather indefinite; membrane between first and second spines, with a distinct dark spot about as large as eye; 14 small, dark spots arranged in pairs along base of dorsal; smaller, less distinct spots above these tips of anal rays white; a narrow, blackish band below the white tips; lower part of pectoral more dusky than upper.

Some measurements, expressed in hundredths, of the body are here given: Length of body, 43 mm.; head, .27; depth of body, .24; distance from snout to dorsal, .26; snout to ventrals, .26; snout to anal, .52; depth of caudal peduncle, .09; length of snout, .10; diameter of eye, .07; length of orbital cirrus, .09; width of interorbital space, .03; length of base of spinous dorsal, .34; base of soft dorsal, .38; height of longest dorsal spine, .11; ray, .14; length of base of anal, .47; length of longest anal ray, .11; length of pectoral, .20; ventral, .16; caudal, .17.

The species is named in memory of our old friend and schoolmate at Cornell, Riokichi Yatabe, formerly professor of botany in the University of Tokyo, lately drowned in a sad accident in the bay of Kamakura.

PHOLIDAPUS DYBOWSKII (Steindachner).

(*Pholidapus grebnitzkii* Bean and Bean.)

Iturup Island (*Albatross*): Volcano Bay (*Grebnitsky*).

OPISTHOCENTRUS OCELLATUS (Tilesius).

(*Gunellus apos* Cuvier and Valenciennes.)
(*Opisthocentrus quinquemaculatus* Kner.)
(*Blennophidium petropauli* Boulenger.)
(*Apisthocentrus tenuis* Bean and Bean.)

Iturup Island (*Albatross*): Volcano Bay, Hokkaido (*Albatross*).

ENEDRIAS NEBULOSUS (Temminck and Schlegel).

(*Centronotus subfrenatus* Gill.)

Hakodate (*Albatross*); Tokyo (Otaki).

PHOLIS PICTUS (Kner).

Iturup Island (*Albatross*).

PHOLIS DOLICHOGASTER (Pallas).

(*Gunellus ruberrimus* Cuvier and Valenciennes.)

Kuril Islands (*Albatross*).

THERAGRA CHALCOGRAMMUS (Pallas).

Kuril Islands (*Albatross*).

GADUS MACROCEPHALUS Tilesius.

Kuril Islands (*Albatross*).

LOTELLA PHYCIS Temminck and Schlegel.

(*Lotella schlegeli* Kaup.)

Tokyo (Otaki; *Albatross*).

ABYSSICOLA MACROCHIR (Günther).

Off Tokyo (*Albatross*).

CŒLORHYNCHUS KISHINOUYEI Jordan and Snyder. New species.

(Plate XX.)

Mr. Otaki's collection contains one specimen of *Cœlorhynchus* which is apparently closely related to *C. australis*. It differs markedly from that species as described, in having a shorter snout and a much larger eye.

Type.—No. 49395, U.S.N.M.

Locality.—Misaki, Japan. Collector, K. Otaki.

Description.—Head, 5½ in length; depth of body, 6½; length of snout, 3¼ in head; diameter of eye, 2½; length of maxillary, 4; width of interorbital space, 4½; height of dorsal, 1⅔; length of longest anal rays, 2½; pectoral rays, 1⅔; ventral rays, 2¾; number scales in lateral line, 129+; between insertion of dorsal and lateral line, 5; dorsal rays, 11+116[1]; anal rays, 108; pectoral rays, 16; ventral rays, 7.

Snout sharp; compressed; its dorsal outline concave; viewed from above, the outline is rounded. Transverse ridges of head distinct; continued in a straight line from tip of snout to edge of preopercle; median dorsal region of snout with a keel which broadens toward the interorbital region; a low curved ridge anterior to nostrils; passing upward and posteriorly, joining interorbital rim above the eye, and thence running backward along the top of head and occiput; a pronounced ridge extending from the orbit backward above upper edge of opercles. Eye very large; somewhat oblong; equidistant from snout and posterior edge of opercle. Anterior end of mouth just behind a vertical through edge of orbit; angle of mouth below center of pupil. Symphysis of lower jaw with a barbel. Teeth villiform; in patches which grow wider anteriorly. Slit of anterior gill-membrane ⅓ wider than that of posterior; width of latter equal to distance between occipital ridges. Lateral line following the dorsal contour. Scales with 16 to 19 spiny ridges; scales of upper part of head, especially those of ridges, plate-like; with minute spines. First dorsal spine minute; second, long; smooth; rays successively shorter. Pectoral pointed; upper rays longest. Ventral extending to base of anal; its first ray with a short, slender filament. Color in alcohol, brownish; a dark spot on axillary region; a narrow dark band along base of anal. Some carefully made measurements of the type are here given.

Length of head, measured from tip of snout to posterior edge of opercle, .67 mm.; length of snout, .32 of head; longitudinal diameter of eye, .38; vertical diameter of eye, .31; distance between orbit and lower edge of transverse ridge, .08; interorbital space, .22; tip of snout to anterior edge of mouth, .32; cleft of mouth, .17; length of barbel, —; width of gill-opening, .49; slit in anterior gill-membrane, .14; in posterior gill-membrane, .09; length of second dorsal spine, .70; first ray, .70; last ray, .17; longest pectoral ray, .81; ventral ray with filament, .43; anal ray, .35.

This species is named for Dr. Kamakichi Kishinouye, of the Imperial Fisheries Bureau of Japan.

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[1] From this specimen the extreme tip of the tail is lost, so the exact number of dorsal and anal rays and the character of the caudal fin are unknown.

Family PLEURONECTIDÆ.

VERASPER VARIEGATUS (Temminck and Schlegel).

Tokyo (Otaki; *Albatross*).

VERASPER MOSERI Jordan and Gilbert.

Iturup Island; Hakodate (*Albatross*).

VERASPER OTAKII Jordan and Snyder, new species.

Type.—No. 49396, U.S.N.M.

Locality.—Tokyo, Japan. Collector, K. Otaki.

Description.—Head 3⅘ in length; depth of caudal peduncle, 10½; longitudinal diameter of lower orbit, 4 in head; length of snout, 5½; maxillary, 2½; width of interorbital space, 6 in diameter of eye; height of longest dorsal rays, 2⅔ in head; anal rays, 2⅔; rays of right pectoral, 1⅘; ventral, 3½; number of dorsal rays, 86; anal, 68; pectoral, 11. Number of scales in lateral line: On eyed side, 92; on blind side, 98.

Body dextral, dorsal outline a little more convex than ventral. Mouth wide, oblique; outline of gape strongly curved; maxillary reaching a vertical from posterior edge of pupil; symphyseal knob small. Teeth of both jaws small, growing larger anteriorly; those of the upper jaw in two series, the inner ones small, the outer larger and canine-like; teeth of lower jaw in a single series. Gill rakers, 6+17; rather slender, length of longest contained 4 times in maxillary. Anterior nostril with a dermal flap which extends to posterior edge of second nostril. Anterior margins of eyes opposite each other. Interorbital space narrow, convex. Lateral line arched above pectoral, the width of arch equal to length of pectoral. Right side of body and head, except snout, lower jaw, and a small space near vent, covered with small, strongly ctenoid scales; left side of body with smooth scales; on both sides of body are small, elongate scales wedged in between the larger ones; rays of dorsal, anal, and caudal fins with small scales; posterior edge of maxillary with a few small scales. Dorsal fin beginning over anterior edge of pupil; each ray with a small, projecting filament; anal with a naked spine at its insertion; rays with filaments; dorsal and anal ending opposite each other; edge of caudal bluntly angular. Upper rays of right pectoral longest; pectoral of blind side shorter, its length contained 2⅓ in head, its middle rays longest. Color in alcohol, brownish; head with an indistinct dark spot just below angle of preopercle; two similar spots on a line behind upper eye; body with six well-defined dark spots with indistinct light markings, arranged 3 above and 3 below lateral line; of the anterior pair, the upper is a little in advance of the lower one, others opposite each other; two indefinite spots above the lateral line, just posterior to angle of opercle; fins without spots; snout on blind side with a transverse black blotch, which is continued on the lower jaw.

One specimen was taken. We here record some carefully made measurements: Length of body in mm., 280; length of head in body, .26; depth of body, .44; depth of caudal peduncle, .10; distance from snout to dorsal, .09; snout to anal, .31; anal to caudal, .06½; length of snout, .05½; maxillary, .11; diameter of lower orbit, .06; upper orbit, .07; width of interorbital space, .01⅛; length of first dorsal ray, .03½; highest dorsal ray, .11½; first anal ray, .04; highest anal ray, .11; length of right pectoral, .14; left pectoral, .11; caudal, .20; ventral, .07.

Named for Professor Otaki, who first recognized its specific distinctness and who figured it as "*Hippoglossus*, new species."

PARALICHTHYS OLIVACEUS (Temminck and Schlegel).

Tokyo (Otaki).
Hakodate (*Albatross*).

RHOMBISCUS[1] CINNAMOMEUS (Temminck and Schlegel).

Tokyo (Otaki).

PLEURONICHTHYS CORNUTUS (Temminck and Schlegel).

Hakodate (*Albatross*).
Tokyo (Otaki; *Albatross*).

LIMANDA YOKOHAMÆ (Günther).

Tokyo (Otaki).
Hakodate (*Albatross*).

CLIDODERMA ASPERRIMUM (Temminck and Schlegel).

Tokyo (Otaki).

KAREIUS[2] SCUTIFER Steindachner.

Hakodate (*Albatross*).
Tokyo (Otaki).

LIOPSETTA OBSCURA (Herzenstein).

Iturup Island (*Albatross*).

PLATICHTHYS STELLATUS (Pallas).

Robben Island (*Albatross*).

---

[1] *Rhombiscus* Jordan and Snyder (type, *cinnamomeus*) differs from *Paratichthys* in the small, uniform teeth.

[2] The genus *Kareius* which is here established (type, *K. scutifer*), is allied to *Liopsetta*, differing in the absence of scales and in the presence of certain large horny warts. The name is from the Japanese word *Karei*, flounder.

Family SOLEIDÆ.

USINOSTIA[1] JAPONICA (Temminck and Schlegel).

Tokyo (Otaki).

ZEBRIAS[2] ZEBRINA (Temminck and Schlegel).

Nagasaki (Otaki).

CYNOGLOSSUS INTERRUPTUS Günther.

Tokyo (Otaki).

ARELISCUS[3] JOYNERI (Günther).

Tokyo (Otaki).

Family LOPHIIDÆ.

LOPHIOMUS SETIGERUS Vahl.

Tokyo (Otaki).

Family ANTENNARIDÆ.

ANTENNARIUS TRIDENS (Temminck and Schlegel).

Yokohama (*Albatross;* Otaki).

---

[1] The new genus *Usinostia* (*japonica*) differs from *Paraplagusia* in the presence of three lateral lines instead of two. *Ushinoshita* (cow-tongue) is the Japanese common name.

[2] The new genus *Zebrias* (*zebrinus*) differs from *Synaptura* in having the left pectoral rudimentary.

[3] The new genus *Areliscus* has 3 lateral lines: *Cynoglossus* (=*Arelia*) has 2.

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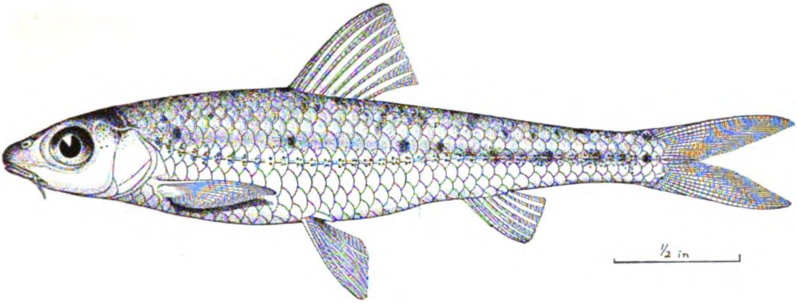

Fig. 1.

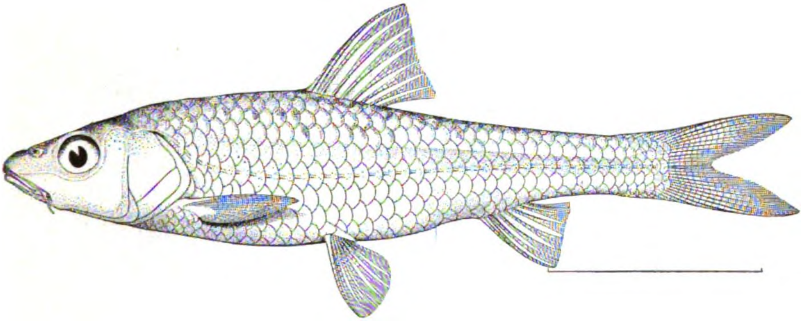

Fig. 2.

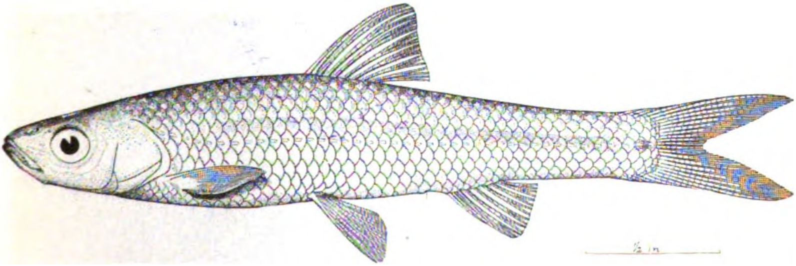

Fig. 3.

FIG. 1. GOBIO BIWÆ. FIG. 2. GOBIO MAYEDÆ. FIG. 3. OTAKIA RASBORINA.

FOR EXPLANATION OF PLATE SEE PAGES 340, 342, 345.

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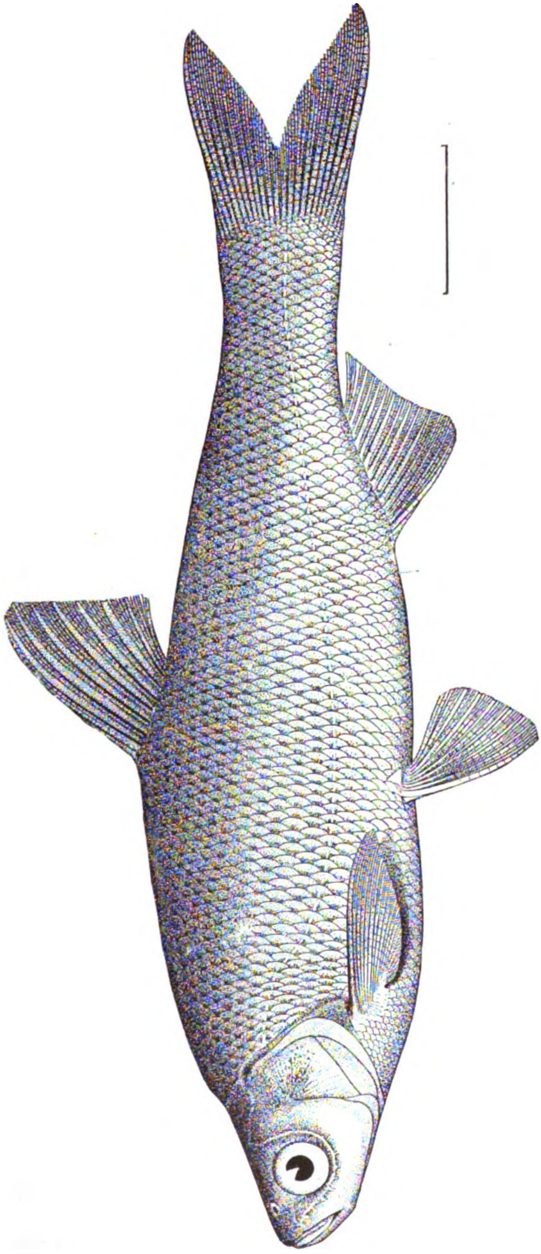

ISCHIKAUIA STEENACKERI.

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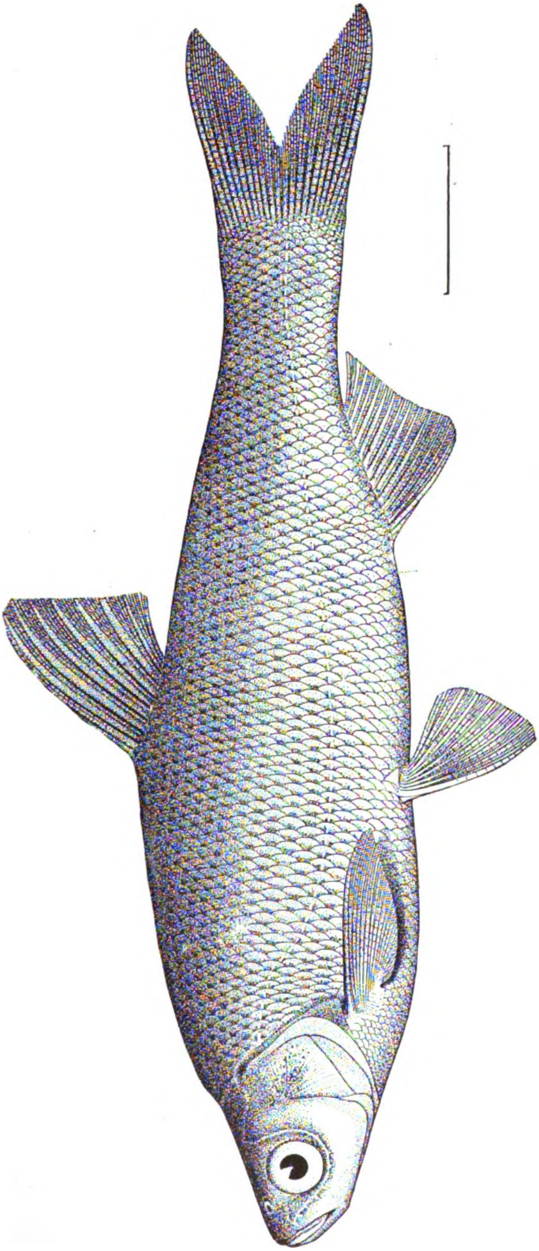

ISCHIKAUIA STEENACKERI.

FOR EXPLANATION OF PLATE SEE PAGE 346.

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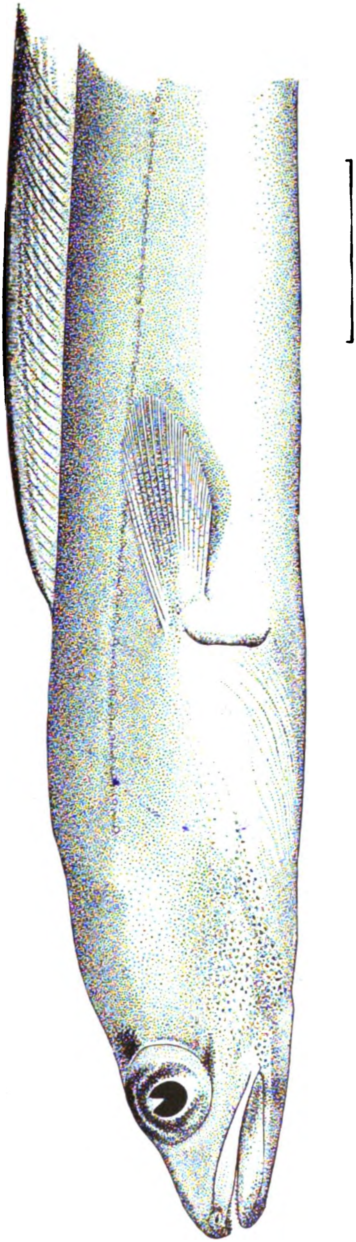

CONGRELLUS MEEKI.

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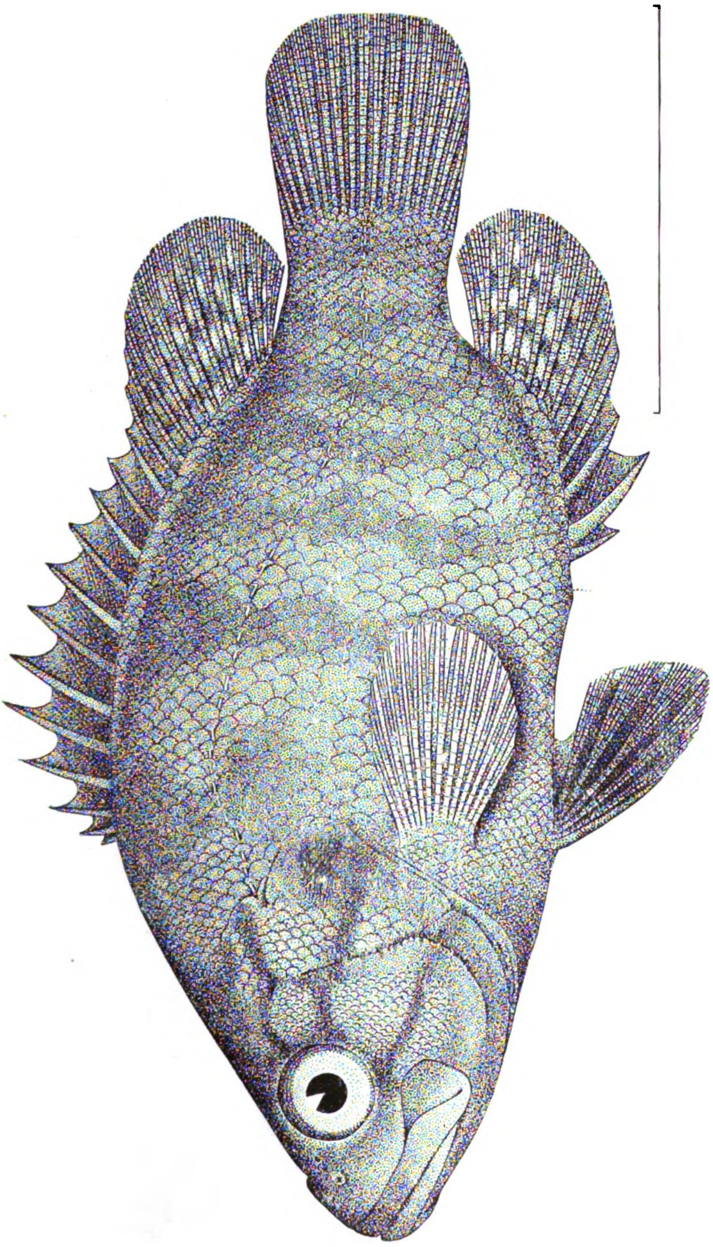

BRYTTOSUS KAWAMEBARI.

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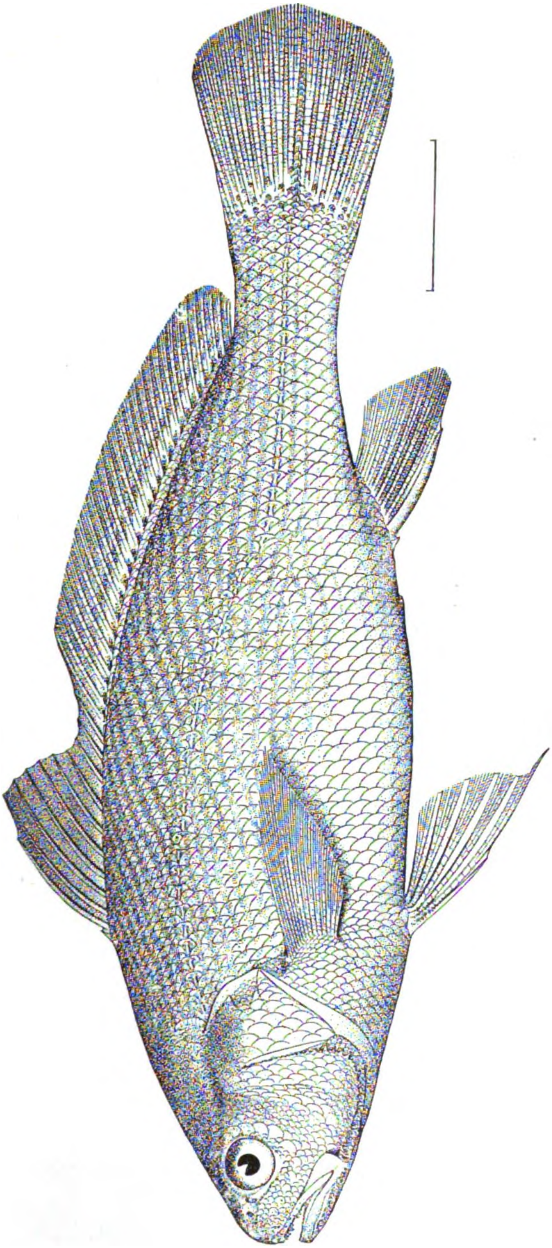

PSEUDOTOLITHUS MITSUKURII.

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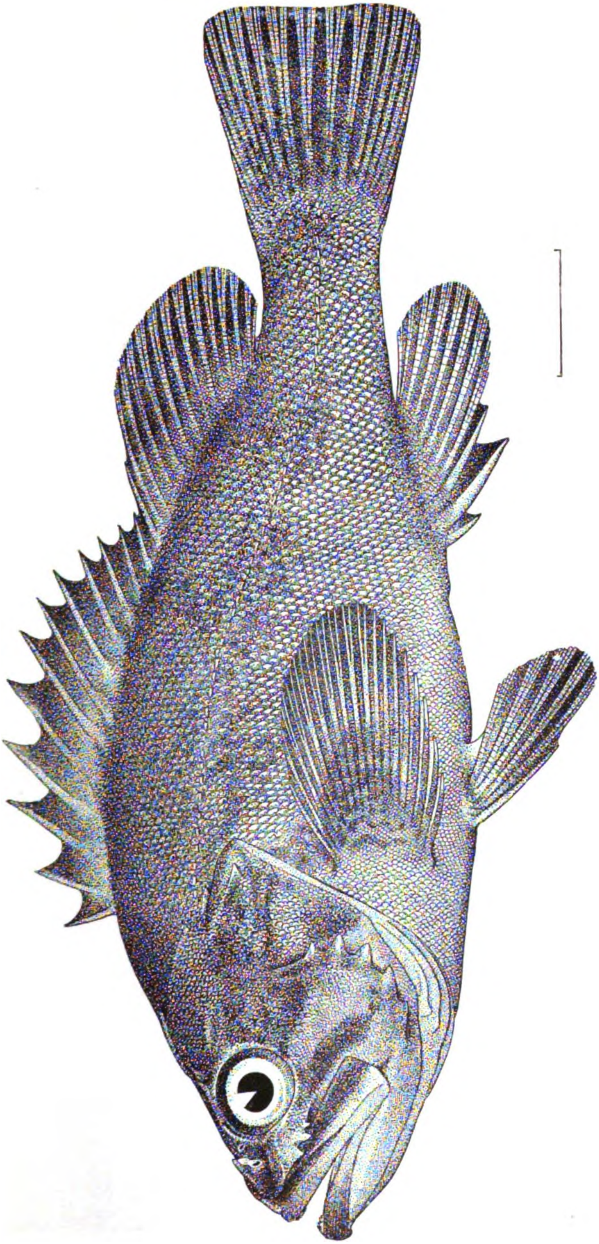
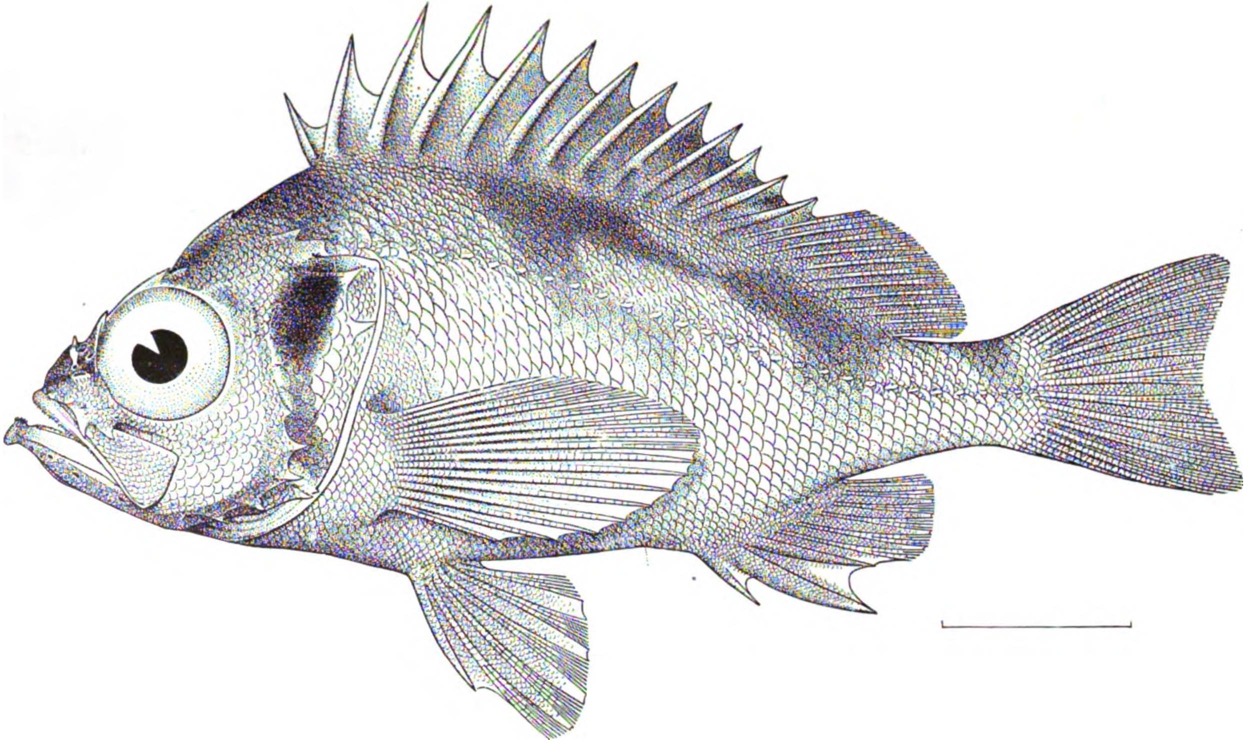


SEBASTODES HAKODATIS.

FOR EXPLANATION OF PLATE SEE PAGE 381.



SEBASTODES SCYTHROPUS.

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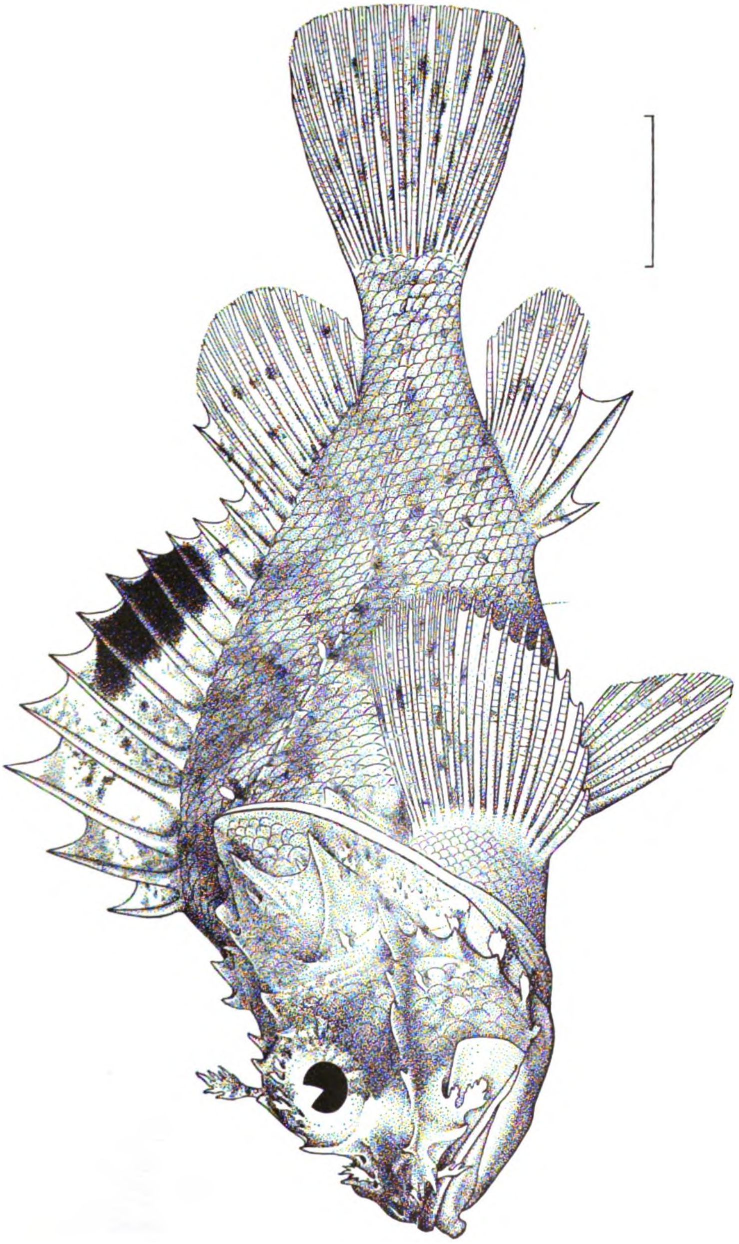
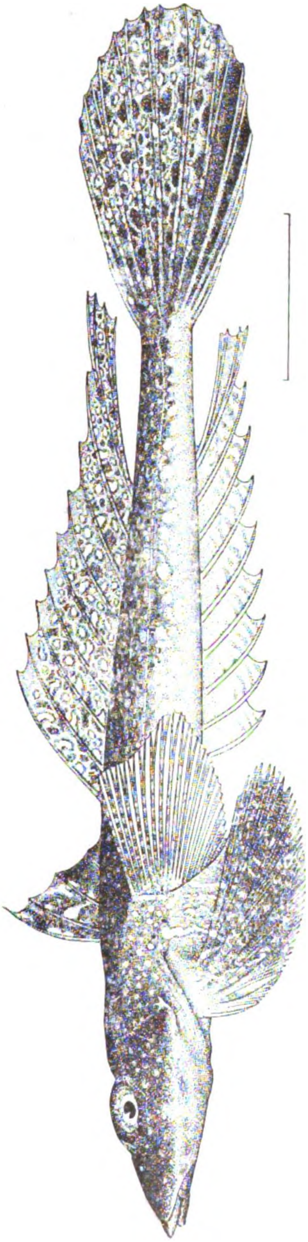


SCORPÆNA ONARIA.

FOR EXPLANATION OF PLATE SEE PAGE 365.



CALLIONYMUS BENITEGURI.

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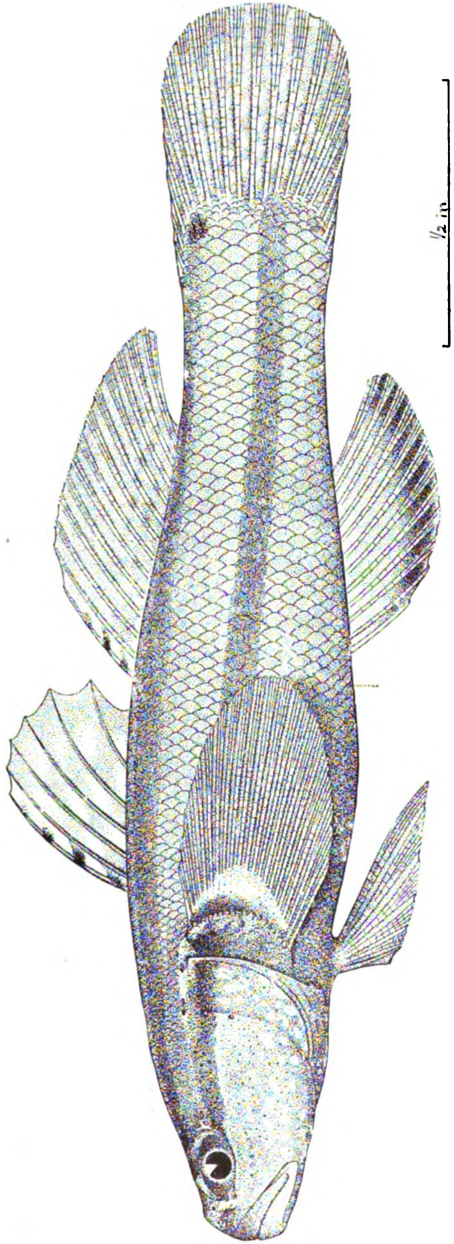
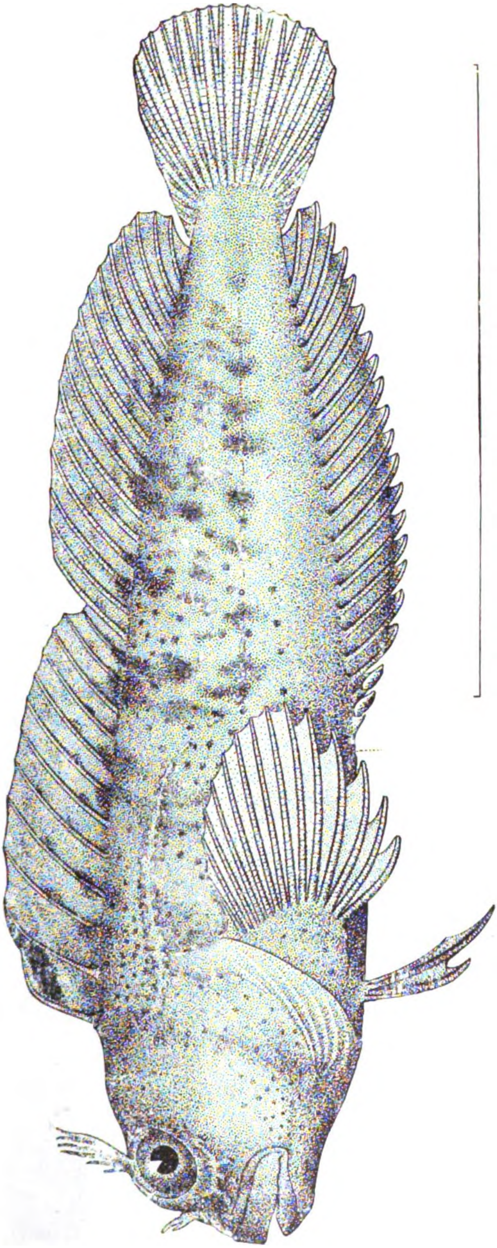


TRIFISSUS IOTURUS.

FOR EXPLANATION OF PLATE SEE PAGE 373.



BLENNIUS YATEBEI.

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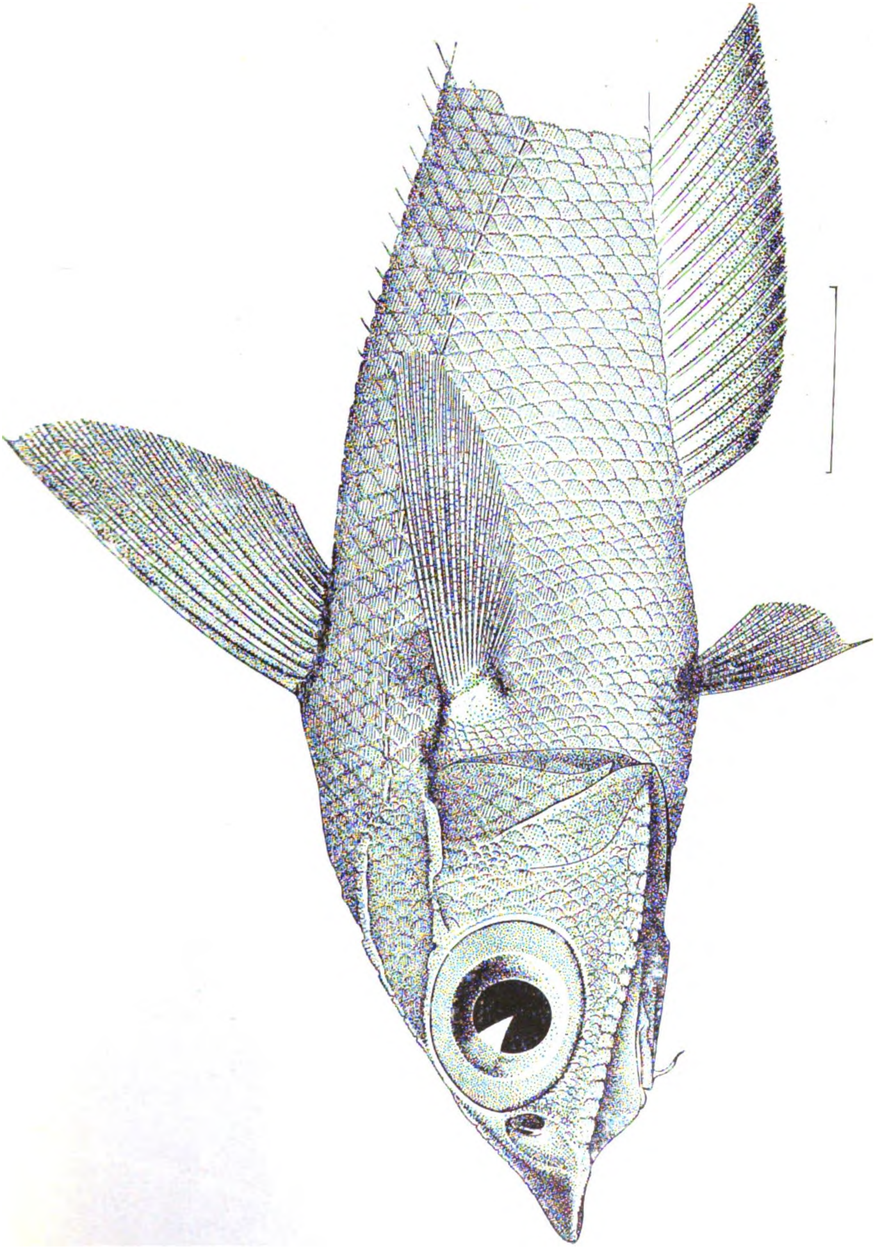

CŒLORHYNCHUS KISHINOUYEI.

FOR EXPLANATION OF PLATE SEE PAGE 378

SYNOPSIS OF THE FAMILY CARDIIDÆ AND OF THE NORTH AMERICAN SPECIES.

By William Healey Dall,
Honorary Curator, Division of Mollusks.

In pursuance of the plan already carried out for the Mactracea, Diplodontidæ, Leptonacea, Psammobiidæ, Solenidæ, and Tellinidæ, I have prepared the following synopsis of the *Cardiidæ*, to include the species found on both coasts of North America, as well as the subdivisions of the family considered as a whole. I should perhaps explain, for the benefit of students who have not followed recent systematic changes, that this family is here regarded as not including the curious brackish-water forms associated with *Adacna* in the waters of the Caspian and the Tertiary horizons of southeastern Europe. These forms were separated as a distinct family, *Limnocardiidæ*, by Stoliczka in 1870.

The forms included in the present paper have the hinge teeth arched (Cyclodont), springing from below the hinge margin, with the hinge plate obscure or undeveloped, and in many cases the two cardinal teeth in one of the valves rotated so that one stands above the other, while in the opposite valve one precedes the other horizontally, so that the axes of the two pairs when the shell is closed cross each other nearly at right angles. There is a small and a large cardinal in each valve; when the shell is closed the two small cardinals are external to the large ones. The laterals are present in all except *Lophocardium*. The sculpture of the shell is chiefly radial, the lobes of the mantle free below the siphons, the foot geniculate, elongated, and rounded, except in *Serripes*, which has it compressed and serrate below. The gills have a very simple type of reticulation, strongly plicate; the anal chamber in some cases is separated from the pedal by a siphonal septum. The ligament and resilium are parivincular, external and posterior. The valves have serrate margins and frequently gape behind.

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SYNOPSIS OF THE FAMILY CARDIIDÆ.

Genus CARDIUM (Linnæus) Lamarck.

(Syn. *Cardium* Linnæus, 1758, part; + *Cerastes* and *Cerastoderma* Poli, 1795; + *Acanthocardia* Gray, 1851; + *Acanthocardium* Roemer, 1869; + *Eucardium* Fischer, 1887; + *Criocardium* Conrad, 1870; + *Cardea* [Conrad, MS.] Whitfield, 1885; + *Plagiocardium* Cossmann, 1887; + *Papillicardium*, Sacco, 1899.)

Subgenus **Cardium** s. s. Type *Cardium aculeatum* Linnæus.

Subgenus **Trachycardium** Mörch. (Syn. *Trachycardium* Mörch, 1853; + *Granocardium* Gabb, 1868.) Type, *Cardium isocardia* Linnæus.

Section *Acrosterigma* Dall, 1900. Shell with an elevated mesial rib internally, radiating from the umbonal cavity. Type, *Cardium dalli* Heilprin; Pliocene of Florida.

Subgenus **Ringicardium** Fischer. (Syn. *Ringicardium* Fischer, 1887; +*Bucardium* Gray, 1853, *ex parte*, not of Megerle, 1811; *Pectunculus* (Adanson) Mörch, 1853; not of Lamarck, 1799.) Type, *Cardium ringens* Gmelin.

Subgenus **Cerastoderma** Mörch. (Syn. *Cerastoderma* Mörch, 1853; +*Cardium* s. s. Gray, 1851, not of Lamarck, 1799; +*Parvicardium* Monterosato, 1884.) Type, *Cardium edule* Linnæus.

Section *Dinocardium* Dall, 1900. Type, *Cardium magnum* Born.

Subgenus **Ethmocardium** White, 1880. Type, *Cardium whitei* Dall, = *Cardium speciosum* Meek and Hayden, 1857, not *Cardium speciosum* Adams and Reeve, 1850; Cretaceous.

Subgenus **Tropidocardium** Roemer. (Syn. *Tropidocardium* Roemer, 1868; + *Cardium* s. s. of many authors, not of Lamarck, 1799.) Type, *Cardium costatum* Linnæus.

Subgenus **Fragum** Bolten. . (Syn. *Fragum* Bolten, 1798; + *Isocardia* Oken, 1815, not of Lamarck, 1799; + *Hemicardium* Swainson, 1840; + *Bucardium* Gray, 1853; + *Loxocardium* Cossmann, 1887.)

Section *Fragum* s. s. Type, *Cardium unedo* Linnæus.

Section *Hemicardium* (Cuvier) Dall, 1900. Type, *Cardium hemicardium* Linnæus.

Section *Trigoniocardia* Dall, 1900. Type, *Cardium graniferum* Sowerby.

Section *Ctenocardia* H. and A. Adams, 1857. Type, *Cardium hystrix* Reeve.

Subgenus **Papyridea** Swainson (Syn. *Papyridea* Swainson, 1840.) Type, *Cardium spinosum* Meuschen.

Section *Fulvia* Gray. (Syn. *Fulvia* Gray, 1853, not *Fulvia* H. and A. Adams, 1858; Fischer, 1887, etc.) Type, *Cardium apertum* Bruguière.

Subgenus **Lævicardium** Swainson. (Syn. *Lævicardium* Swainson, 1840; + *Liocardium* Mörch, 1853.) Type, *Cardium norvegicum* Spengler.

Section *Pachycardium* Conrad, 1870. Type, *Cardium spillmani* Conrad; Cretaceous.

Subgenus **Discors** Deshayes. (Syn. *Discors* Deshayes, 1858; + *Lyrocardium* Meek, 1876; + *Amphicardium* von Martens, 1880; + *Divaricardium* Dollfus and Dautzenberg, 1886.) Type, *Cardium subdiscors* d'Orbigny.

Genus SERRIPES Beck.

(Syn. *Serripes* (Beck) Gould, 1841; + *Aphrodite* Lea, 1834, not Hübner, 1816; + *Acardo* Swainson, 1840, not of Lamarck, 1799.) Type, *Cardium grönlandicum* Gmelin.

Genus CORCULUM Bolten.

(Syn. *Corculum* Bolten, 1798; + *Cardissa* Megerle, 1811; + *Isocardia* Oken, 1815, not of Lamarck, 1799; + *Les Hemicardes* Cuvier, 1817, *ex parte;* + *Hemicardium* Ferussac, 1822; + *Hemicardia* Mörch, 1853.) Type, *Cardium cardissa* Linnæus.

Genus LUNULICARDIA Gray.

(Syn. *Lunulicardia* Gray, 1853; + *Opisocardium* Bayle, 1879.) Type, *Cardium retusum* Linnæus.

Genus AVICULARIUM Gray.

(Syn. *Avicularium* Gray, 1853; + *Lithocardium* Woodward, 1854.)

Section *Avicularium* s. s. Type, *Cardium aviculare* Lamarck.

Section *Byssocardium* Munier Chalmas, 1882. Type, *Cardium emarginatum* Deshayes.

(*Pterocardia* Bayan, 1874, and *Goniocardium* Vasseur, 1880, are suspiciously close to *Avicularium.*)

Genus PROTOCARDIA Beyrich.

(Syn. *Protocardia* Beyrich, 1845; + *Protocardium* Meek and Hayden, 1860; + *Nemocardium* Meek, 1876.)

Section *Protocardia* s. s. Type, *Cardium hillanum* Sowerby.

Section *Nemocardium* Meek. Type, *Cardium semiasperum* Deshayes.

Section *Leptocardia* Meek, 1876. Type, *Cardium subquadratum*.

Evans and Shumard; Cretaceous.

Subgenus **Lophocardium** Fischer, 1887. Type, *Cardium cumingi* Broderip.

? Genus HEMIDONAX Mörch.

(Syn. *Hemidonax* Mörch, 1870; + *Donacicardium* Vest, 1876; + *Donaciocardium* von Martens, 1876.) Type, *Cardium donaciforme* Schroeter.

This group probably belongs with the Donacidæ.

EAST AMERICAN SPECIES.

Cardium (Trachycardium) isocardia Linnæus, 1758.

Range: Cape Hatteras, North Carolina, to Trinidad Island, West Indies. Pliocene to Recent.

This includes *Cardium egmontianum* Shuttleworth, 1856, and *Cardium eburniferum* Guppy, 1875.

Cardium (Trachycardium) muricatum Linnæus, 1758.

Range: North Carolina to Santa Caterina, Brazil. Pleistocene.

This is *Cardium muricatum* Linnæus, No. 69, not No. 62, 1758; + *Cardium campechiense* Bolten, 1798; + *Cardium gossei* Deshayes, 1854.

Cardium (Trachycardium) leucostoma Born, 1780.

Range: West Indies.

This includes *Cardium marmoreum* Lamarck, 1819; + *Cardium elongatum* Wood, 1815, and Sowerby, 1831, not Bruguière, 1789; + *Cardium magnum* Wood, 1825. I am inclined to think this shell may be the original *Cardium magnum* Linnæus.

Cardium (Trachycardium) subelongatum Sowerby, 1840.

Range: Southern West Indies.

This is not the *Cardium angulatum* Lamarck as assumed by some authors.

Cardium (Cerastoderma) ciliatum O. Fabricius, 1780.

Range: Arctic and boreal seas south to Cape Cod on the Atlantic and to Puget Sound on the Pacific side.

This is *Cardium islandicum* Chemnitz, 1782; + *Cardium edule* Mohr, 1786, not of Linnæus; + *Cardium pubescens* Couthouy, 1838; + *Cardium arcticum* Sowerby, 1840; + *Cardium dawsoni* Stimpson, 1862; + *Cardium hayesii* Stimpson, 1863; + *Cardium boreale* Broderip and Sowerby, 1829, not of Reeve, 1844. The small compact specimens which have lost their pubescence form Stimpson's *Cardium hayesii*.

Cardium (Cerastoderma) elegantulum Beck, 1842.

Range: Greenland, 90 fathoms.

This is described from Beck's manuscript in Möller's Index Moll. Grönl., 1842.

Cardium (Cerastoderma) pinnulatum Conrad, 1831.

Range: Labrador to Cape Lookout, North Carolina, in 1 to 266 fathoms. Also Pleistocene of New Brunswick.

Cardium (Dinocardium) robustum Solander, 1786.

Range: Cape May, New Jersey, south to Belize and Jamaica, West Indies. Upper Miocene to Recent.

This is best known under the name of *Cardium magnum* Born, 1780, but it is not the *Cardium magnum* of Linnæus, 1758; it is *Cardium ventricosum* Bruguière, 1789; *Cardium maculatum* Gmelin, 1792; + *Cardium carolinense* Conrad, 1862, not of Conrad, 1875.

Cardium (Fragum) medium Linnæus, 1758.

Range: Cape Lookout, North Carolina, south to Santa Marta, Brazil. Upper Miocene to Recent.

This includes *Cardium venustum* Dunker, 1861, and *Cardium columba* Heilprin, 1886; but not *Cardium magnificum* Deshayes, as stated by Carpenter.

Cardium (Trigoniocardia) antillarum Orbigny, 1845.

Range: Straits of Florida to Guadeloupe Island, West Indies, in 2 to 182 fathoms.

This includes *Cardium ceramidum* Dall, 1886.

Cardium (Papyridea) spinosum Meuschen, 1787.

Range: Cape Hatteras, North Carolina, south to Santa Marta, Brazil. Pleistocene.

This includes *Cardium hiatus* Meuschen, 1787; + *Cardium bullatum* Chemnitz (Solen), 1782, not of Linnæus, 1758; + *Cardium bullatum* of many authors but not of Linnæus; + *Cardium soleniforme* Bruguière, 1789; ?+ *Cardium latum* Born, 1780, not *Cardium latum* "Born" Reeve, 1844; + *Cardium hiulcum* Reeve (monstr.), 1844.

Curiously the Pliocene form of Florida is identical, not with the existing type of the Antilles, but with that of the southeast Atlantic, St. Helena, and the Cape Verde Islands, a variety with the angle of the ribs minutely crenulate, which I have named *Cardium spinosum* var. *turtoni.* The Pacific species is hardly more than varietally different from the West Indian form, and will retain Sowerby's name of *aspersum* in a varietal sense.

Cardium (Papyridea) semisulcatum Gray, 1825.

Range: Southern Florida, south through the West Indies to Trinidad and the Cape of Good Hope, in 3 to 300 fathoms. Pliocene to Recent.

This is *Cardium ringiculum* Sowerby, 1840; + *Cardium petitianum* Orbigny, 1845.

Cardium (Lævicardium) serratum Linnæus, 1758.

Range: Cape Hatteras, North Carolina, south to Guadeloupe, West Indies, in 1 to 75 fathoms. Oligocene to Recent.

This is not *Cardium serratum* Pennant, 1778; but is the *Cardium lævigatum* of Born, 1780; and of Lamarck, 1819; the *Cardium citrinum* of Wood, 1815; the *Cardium pictum* Ravenel, 1861 (*testa juv.*). but not of Dunker, 1861; the *Cardium lineatum* of Krebs, 1864, but not of Gmelin, 1792; the *Cardium pristis* Valenciennes, 1846; probably the *Cardium oviputamen* Reeve, 1844; the *Cardium venustum* of Gabb, 1873, but not of Dunker, 1861; the *Cardium lævigatum* Reeve, 1844, but not of Linnæus, 1758; and the *Cardium glabratum* of Roemer, 1869.

Cardium serratum var. **brasilianum** Lamarck, 1819.

Range: Southern West Indies south along the coast of Brazil.

This is the *Cardium lamarckii* Orbigny, 1847, but not the *Cardium brasiliense* of Gmelin, 1792, which was founded on the figure of an *Arca.*

Cardium serratum var. **sybariticum** Dall, 1886.

Range: West Indies (Barbados, etc.), in 100 fathoms or more. Oligocene to Recent.

This is a deep-water dwarf form of *serratum*. It may include *Cardium pictum* Ravenel, but certainty can not be attained on account of the loss of Ravenel's types.

Cardium (Lævicardium) mortoni Conrad, 1830.

Range: Nova Scotia to Santa Marta, Brazil, in 1 to 5 fathoms. Miocene to Recent.

Serripes gronlandicus Gmelin, 1792.

Range: Arctic and boreal seas, south to Cape Cod on the Atlantic and Puget Sound on the Pacific side, in 2 to 60 fathoms. Pleistocene.

This is the *Mactra radiata* of Donovan, 1799; the *Cardium edentulum* of Montagu, 1808; *Aphrodite columba* Lea, 1834; *Cardium boreale* Reeve, 1844, not of Broderip and Sowerby, 1829; and *Cardium fabricii* Deshayes, 1854.

Protocardia peramabilis Dall, 1886.

Range: Rhode Island southward in deep water to Grenada, West Indies, 18 to 164 fathoms.

Protocardia tincta Dall, 1886.

Range: Key West, Barbados, Santa Cruz, and Porto Rico, in 7 to 100 fathoms.

This was described as a variety of the preceding, which is a white or yellowish shell, but the receipt of more specimens shows them to be quite distinct.

NOTES.

Cardium haitense Guppy, as of Sowerby, 1877, said to be dredged alive in the Gulf of Paria, is probably *Cardium antillarum* Orbigny or a related species.

Cardium pictum Dunker, 1861 (April, not *Cardium pictum* Ravenel, February, 1861), is probably a variety of *Cardium papillosum* Poli, from south Europe, with a wrong locality label. It was a dealer's shell.

Cardium pectinatum (Linnæus) Menke, cited from St. Vincent, is from the island of that name in the Cape Verde group, not the Antillean St. Vincent.

Cardium cygnorum Deshayes, cited by J. Matthew Jones from Bermuda, is probably a misidentification, as Deshayes's species came from Swan River, Australia, and if found on Bermuda must have been adventitious.

Cardium echinatum O. Fabricius, 1780, from Greenland was doubtless derived from European ballast.

Cardium fasciatum Montagu, of Wheatley, 1842, from South Carolina, and De Kay, 1843, has not been authenticated as occurring on the American coast, though it occurs in Iceland.

WEST AMERICAN SPECIES.

Cardium (Trachycardium) quadragenarium Conrad, 1837.

Range: Santa Barbara, California, to Todos Santos Bay, Lower California, in 24 to 60 fathoms.

This is *Cardium luteolabrum* Gould, 1851; + *Cardium xanthocheilum* (Gould MS.) Carpenter, 1856; + *Cardium arenatum* Carpenter (*testa juv.*), 1857; + *Cardium setosum* Tryon, 1872, not Redfield, 1846.

Shells from deep water are remarkably fine and among the largest of the genus. The number of ribs ranges from 42 to 44 and in a remarkable oval variety, much more oblique than the typical form, to 46. It may be noted that nearly all Cardia have an oval and a more rotund variety, possibly to be correlated with sex.

Cardium (Trachycardium) consors Sowerby, 1833.

Range: Gulf of California south to the Galapagos Islands.

A fine and well-known shell. A variety *laxum* Dall has the imbrications twice as distant as usual and more elongated. The specimens seen were from the Gulf of California and were all of a color decidedly lighter than the type. The ribs vary from 31 to 34.

Cardium (Trachycardium) maculosum Wood, 1815.

Range: Panamic region; St. Elena, Colombia.

This is *Cardium multistriatum* Sowerby, 1833, and perhaps also *Cardium arenicolum* Reeve, 1845.

Cardium (Trachycardium) pristipleura Dall, 1900.

Range: Gulf of California (La Paz) and west coast of Middle America.

This is *Cardium maculosum* Sowerby, 1833, not Wood, 1815; + *Cardium maculatum* Reeve, 1844, not Gmelin, 1792. The shell has 34 to 39 ribs, laterally imbricate. *Cardium lacunosum* Reeve, 1845, should be compared with it.

Cardium (Trachycardium) senticosum Sowerby, 1833.

Range: Gulf of California to Payta, Peru.

This is *Cardium muricatum* Menke, not Linnæus; + *Cardium rastrum* Reeve, 1844; +(?) *Cardium lima* Reeve, 1845; + *Cardium lucinoides* Carpenter (*testa juv.*), 1857. It is the Pacific coast analogue of *Cardium muricatum* Linnæus.

Cardium (Trachycardium) belcheri Sowerby, 1829.

Range: Gulf of California, in 6 to 24 fathoms.

Cardium (Ringicardium) procerum Sowerby, 1833.

Range: Lower California, from the vicinity of Cerros Island south to Ecuador, and Payta, Peru. Pleistocene of upper California.

This is *Cardium laticostatum* Sowerby, 1833, and *Cardium panamense* Sowerby, 1833; + *Cardium subelongatum* Valenciennes, 1846, not of Sowerby, 1840; + *Cardium rotundatum* Carpenter (*testa juv.*), 1857.

There are 7 ribs on the posterior area while the rest of the shell has from 13 to 18.

Cardium (Cerastoderma) corbis Martyn, 1784.

Range: Pribilof Islands, Bering Sea, and the Aleutian chain, and southward to San Diego, California, and Hakodadi, Japan.

This is *Cardium nuttallii* Conrad, 1838; + *Cardium californianum* Conrad (*testa juv.*), 1838; + *Cardium nuttallianum* Carpenter, 1864.

This fine shell normally has thickened loops thrown upward over the backs of the ribs as its proper sculpture, but in some young shells the bight of the loops becomes obsolete, giving an ornament nearly of the type of some species of *Trachycardium*.

Cardium (Cerastoderma) californiense Deshayes, 1839.

Range: Bering Strait southward to Oregon, and Monterey, California, and to Hakodadi, Japan.

This is *Cardium pseudofossile* Reeve, 1844, and *Cardium blandum* Gould (*testa juv.*), 1850.

A variety *comoxense* Dall occurs in the bowlder clay of Vancouver Island with the ribs depressed and flattened to such an extent as to be defined only by the interstitial lines.

Cardium (Cerastoderma) ciliatum O. Fabricius, 1780.

Range: Arctic and boreal seas, southward to Puget Sound and Japan.

For synonymy see under the head of this species in the East American list. The same varieties occur on both coasts.

Cardium (Cerastoderma) decoratum Grewingk, 1850.

Range: Bowlder clays of Alaska and British Columbia.

This species may very likely be found alive hereafter.

Cardium (Fragum) magnificum (Deshayes MS.) in Carpenter, 1857.

Range: Lower California south to Payta, Peru, in 10 to 13 fathoms.

This is *Cardium planicostatum* Sowerby, 1833, not of Sedgwick and Murchison, 1829. Carpenter wrongly refers Deshayes's name to *Cardium medium* as a synonym, but the species is amply distinct from *Cardium medium* and represents it on the Pacific coast.

Cardium (Fragum) biangulatum Sowerby, 1829.

Range: Catalina Island, California, south to Panama.

Cardium (Trigoniocardia) graniferum Broderip and Sowerby, 1829.

Range: Gulf of California to Panama.

Cardium (Trigoniocardia) alabastrum Carpenter, 1857.

Range: Gulf of California, 8 to 24 fathoms; Mazatlan.

Cardium (Trigoniocardia) ovuloide Reeve, 1845.

Range: West coast of middle America?

Cardium (Trigoniocardia) obovale Sowerby, 1833.

Range: Margarita Bay, Lower California, to Ecuador.

Cardium (Papyridea) spinosum Meuschen, 1787, variety **aspersum** Sowerby, 1833.

Range: Margarita Bay, Lower California, and the Gulf of California, south to Panama.

This is cited as *Cardium* "*asperum*" Sowerby by Roemer, 1869. For the synonymy of the species see the East American list.

Cardium (Lævicardium) elatum Sowerby, 1833.

Range: San Pedro, California, and south to Panama. Pleistocene of California.

This is the largest species of the genus. One valve in the United States National Museum measures 170 mm. in height and 143 mm. in length.

Cardium (Lævicardium) substriatum Conrad, 1838.

Range: From Catalina Island and San Pedro, California, south to San Ignacio lagoon, Lower California. Pleistocene of California.

This is *Cardium cruentatum* Gould, 1856.

Cardium (Lævicardium) elenense Sowerby, 1840.

Range: Gulf of California, south to Panama; Clarion Island.

This is *Cardium apicinum* Carpenter, 1864, as Carpenter himself suspected.

Serripes grönlandicus Gmelin, 1792.

Range: Arctic seas, south to Puget Sound and Hakodadi. Pleistocene.

The synonymy is cited in the East American list.

Serripes laperousei Deshayes, 1839.

Range: Bering Strait, at Plover Bay, south to Avatcha Bay, Kamchatka, and Sitka, Alaska.

This is a well-defined species and the specific characters can be recognized in shells less than an inch long.

Protocardia centifilosa Carpenter, 1864.

Range: Queen Charlotte Islands, British Columbia, south to San Diego, California.

Protocardia centifilosa var. **richardsonii**, Whiteaves, 1878.

Range: Queen Charlotte Islands, British Columbia, south to the coast of Oregon.

This is *Fulvia modesta* Adams and Reeve, var. *centifilosa* Carpenter. The *Protocardia modesta* appears to me distinct from the American shell and is a native of Japan. The northern specimens forming the variety are a little stronger and coarser than those from California, with which they seem to be united by intermediate gradations, though the extremes have apparently good distinctions.

Protocardia (Lophocardium) cumingii Sowerby, 1833.

Range: Gulf of Dulce, Central America, 12 fathoms.

Protocardia (Lophocardium) annettæ Dall, 1889.

Range: Gulf of California, 6 to 24 fathoms.

This is distinguished from the preceding species by its greater altitude and lower radial keel.

NOTES.

Cardium aculeatum Linnæus was found, a single worn valve, by Dr. John S. Newberry at Acapulco. It was doubtless a ballast specimen.

Cardium triangulatum "Sowerby" Carpenter, 1857, I have not been able to discover in the literature. It is perhaps a manuscript name taken from a museum tablet.

Cardium gemmatum Gould, in Carpenter, Rep. British Association, 1857, p. 229, appears to be merely a "list name" and does not appear in Gould's works.

Cardium orbita Sowerby, 1833, appears to be an Indo-Pacific and not an American species.

REVISION OF THE ORTHOPTERAN GENUS TRIMEROTROPIS.

By JEROME McNEILL.

The subject of the present paper is a moderately homogeneous group of species belonging to the subfamily *Oedipodinæ* stirps *Oedipodites* Saussure, which is distinguished from other *Oedipodinæ* by having the outer distal spine of the posterior tibiæ remote from the apical spurs and the ocelli adjacent to the eyes. *Trimerotropis* belongs to a group of genera conveniently if not naturally separated from the rest of the stirps by having the median carina of the pronotum cut by two transverse sulci. It may be separated from the North American genera which share this character by the following key:

ANALYTICAL KEY TO TRIMEROTROPIS AND ALLIED GENERA.

a^1 Three-fourths or more of the cells of the distal half of the middle field of the tegmina regularly quadrilateral, arranged in a single row on either side of spurious longitudinal veins (Plate XXI, fig. 3 *S*). Inner edge of the fuscous band, if present, within or at least not far beyond the middle of the wing.

b^1 Intercalary vein nearly straight and about the middle of the median area distally (Plate XXI, fig. 6), or if much in advance of the middle distally with one row of cells on either side (Plate XXI, fig. 3 *I*). Scutellum of the vertex (without the central foveolæ) never much longer than broad and generally broader than long. Median carina of the pronotum cut by the principal sulcus about the middle, rarely the metazone may be as much as one and a half times as long as the prozone.

c^1 Antennæ longer than the posterior femora, swollen and strongly depressed. Frontal costa at its widest point above the ocellus narrower and at the vertex very much narrower than the greatest width of the antennæ. *Psinidia* Stål.

c^2 Antennæ filiform.

d^1 Posterior angle of the lateral lobes of the pronotum never broadly rounded, but extended backward and downward so that the lower margin is somewhat straight and meets the posterior margin at an acute angle. Cranium between the eyes without transverse carinæ.

e^1 Head swollen and not strongly elevated above the disk of the pronotum. Eyes not very prominent, and even in the male plainly shorter than the genal groove. Cranium between the eyes broader than their diameter seen from above.

f¹ Intercalary vein considerably or much in advance of the middle of the median area distally, with a single row of cells on either side. Coloration of the wings and tegmina very like *Hippiscus* (Plate XXI, fig. 3). Size, medium or large. Posterior femora unusually slender. *Metator* new genus.

f² Intercalary vein but little in advance of the middle distally, bordered by several rows, at least posteriorly, of irregular cells. Coloration of tegmina similar to *Conozoa* (Plate XXI, fig. 5) or *Derotmema* (Plate XXI, fig. 6), but never recalling *Hippiscus*. Posterior femora not unusually long. Size, small or medium....... *Mestobregma* Scudder.

e² Head not at all swollen but very strongly elevated above the disk of the pronotum. Cranium between the eyes much less than their diameter seen from above. Eyes very prominent, in the male, at least, longer than the genal groove. Median carina of the pronotum linear except in front of the first sulcus. Wings transparent, rosaceous at the base, hyaline beyond with no trace of a fuscous band.. *Trepidulus* new genus.

d² Posterior angle of the lateral lobes of the pronotum broadly rounded and not extended backward and downward so as to make the lower margin straight. Cranium between the eyes with a transverse carina. Crest of the prozone of the pronotum very high and strongly bilobate or bidentate .... *Derotmema* Scudder.

b² Intercalary vein decidedly curved distally where it is much in advance of the middle of the median area (Plate XXI, fig. 1 *I*), which is occupied almost entirely by a reticulation of irregular cells. Scutellum of the vertex as long as and generally longer than broad. Median carina of the pronotum cut by the principal sulcus much in front of the middle so that the metazone is at least one and a half times as long as the prozone.

c¹ Pronotum with the median carina cristate on the metazone or at least as high as on the prozone. Tegmina with two solid dark spots alternating with two light spots, the former about the end of the first and second quarters, the latter just beyond, all confined to the anterior half of the tegmina (Plate XXI, fig. 5). Posterior angle of the lateral lobes of the pronotum extending downward so as to make the lower border nearly straight .... *Conozoa* Saussure.

c² Pronotum with the median carina linear or slightly cristate on the metazone but generally less elevated than on the prozone. Posterior angle of lateral lobes of the pronotum well rounded or with a downward projecting tooth.

d¹ Radiate veins (branches of second and third A) of the anal field of the wings not swollen, so that they are not much larger medianly than near the base .... *Trimerotropis* Stål.

d² Radiate veins much swollen, so that they are much stronger medianly than near the base (Plate XXI, fig. 4); wings short and broad and frequently strongly lobate on the outer border (Plate XXI, fig. 4). *Circotettix* Scudder.

a² Less than half of the cells of the distal half of the middle field of the tegmina regularly quadrilateral. Inner edge of the fuscous band much beyond the middle of the wing .... *Hadrotettix* Scudder.

Trimerotropis may be briefly defined as follows: Head of moderate size, slightly exceeding the prozone in width, but always exceeded by the metazone, which is considerably expanded. Antennæ filiform, of variable length. Eyes rarely equal to the genal groove. Frontal costa contracted below the ocellus and at the vertex. Sulcate always below and sometimes above the ocellus. Scutellum of the vertex never much shorter and generally longer than broad, usually plainly sulcate with or without a median carina. Central foveolæ generally distinctly separated from the frontal costa and the scutellum of the vertex. Lateral foveolæ distinct and triangular. Pronotum with the disk only moderately wrinkled on the prozone and quite smooth on the metazone, except for granulations. Median carina cristate or rarely only a raised line on the prozone, less elevated on the metazone, especially posteriorly; cut by the principal sulcus much in advance of the middle, so that the metazone is from one and a half to more than twice as long as the prozone, and by the first sulcus, behind the middle of the prozone. Shoulders well marked, but lateral carinæ usually absent except occasionally on the front of metazone and prozone. Process of the metazone acute, right, or obtuse-angular with the sides sinuate, arcuate, or straight. Lateral lobes with the posterior border straight or slightly sinuate and nearly vertical, lower border sinuate anteriorly and arcuate posteriorly, with the posterior angle well rounded or less commonly with a dentation extending downward.

Tegmina plain; isabelline or maculate; in the last case the spots are annular or solid and pretty evenly scattered over the whole surface or much more frequently arranged in three well-marked groups, one each at the end of the first and second quarters and one on the distal third. The first two are generally much better defined than the last and may become solid bands, as in *Hadrotettix*. The intercallary vein is curved forward distally, where it is always much closer to M than to Cu (Plate XXI, fig. 1, I). Area M is filled with a reticulation of irregular cells. R_s has from two to five branches, separated by spurious veins, which are bordered on either side by quadrilateral cells, which become irregular and smaller near the middle of the tegmina. $M_{1\,\&\,2}$ and $M_{3\,\&\,4}$ are present without branches. Cu_1 has one or two anterior accessory branches. Wings sometimes hyaline, but usually colored yellow, green, or blue at the base, hyaline at the apex, with a fuscous band between, varying in width from one-eighth to two-thirds the length of the wing. This fuscous band may include more or less completely the whole outer part of the wing, and it always has a submarginal spur which extends inward toward the base, and it is generally continued around the posterior margin to or toward the posterior angle. R_s is always present, and has one or two branches (Plate XXI, fig. 2). $M_{1\,\&\,2}$ and $M_{3\,\&\,4}$ are present and embranched, as in the tegmina. Cu_1 and *1st A* are simple. *2d* A_1 is unusually prominent, and runs near the middle of the second lobe, where it is accompanied by *2d* A_2, which has one slender branch occupying the first interplical groove and one strong branch, which forms the axis of the third fold and is the second interplical ridge, as the branches of *3d A* form the remaining interplical ridges (Plate XXI, fig. 4, *R* and *G*). None of these radiate veins are especially prominent nor enlarged medianly, as in *Circotettix* (Plate XXI, fig. 4). The posterior femora are moderately developed, with outer face plain or banded and the inner face and lower sulcus black, with one or two light bands on the apical half; or by the fading of the black these markings are modified and may be wanting, especially in the lower sulcus. Posterior tibiæ with eight to ten spines on the outer side.

The genus was established by Stål[1] and fully defined first by Saussure.[2] The genus as here defined includes a considerable number of species which have usually been referred to *Conozoa*. This transfer has been necessary in order to retain this genus, which is still scarcely separable from *Trimerotropis*, but useful, as it contains a few forms widely different from typical forms of the latter genus. The *Hyalina* group of *Trimerotropis* may be considered the connecting link between these genera. Near the other end of this series in the linear arrangement I have adopted the *Fallax* group form, a transition to *Circotettix*, which is distinguished from *Trimerotropis* chiefly by the structure of the wings. The *Texana* group forms a transition to *Derotmena* and the *Citrina* group to *Hadrotettix*.

The genus is confined to the continents of North and South America, and its characteristic habitat is the semiarid regions of the West, though a few species are found east of the Mississippi River. These species, however, are restricted to the sandy shores of rivers or ocean to the bare ground of roads, or to barren, rocky hillsides.

Of the 54 species enumerated 24 are new. Sixteen species are confined to California, as follows: *hyalina*, *rebellis*, *albolineata*, *porrecta*, *coquilletti*, *calignosa*, *albescens*, *koebelei*, *thalassica*, *californica*, *pacifica*, *pilosa*, *fallax*, *conspersa*, *variegata*, and *pseudofasciata*. Three others are confined to the Pacific coast within the United States—*caeruleipes*, *bifasciata*, and *similis*. Three are found east of the Mississippi—*maritima*, *saxatilis*, and *citrina*. The last mentioned extends from the Rocky Mountains to Maryland. The first mentioned is restricted to the Atlantic coast and the shores of the Great Lakes, and *saxatilis* is found in northwest Arkansas and southern Illinois. Five species are not found within the limits of the United States. These are *tolteca*, *ochraceipennis*, *pallidipennis*, *lauta*, and *collaris*. The remaining species, 27, belong to the Rocky Mountain States. *Monticola* extends from Colorado into Mexico, and *pistrinaria* from Texas into Mexico. *Cincta* ranges from California to Texas. *Texana* ranges from Texas to New Mexico; *cristata* from Lower California to Salt Lake Valley, Utah; *latifasciata* from Utah to Washington; *caeruleipennis* from California to Wyoming. Three species, *salina*, *agres-*

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[1] Recensio Orthopterorum I, 1873, pp. 118, 134.

[2] Prodromus Oedipodiorum, 1884, p. 166.

tis, and *praeclara*, are confined to Nebraska; three also, *unbila*, *modesta*, and *melanoptera*, to New Mexico; two, *fratercula* and *campestris*, to Wyoming.

Through the kindness of Dr. S. H. Scudder and Prof. Lawrence Bruner I have been able to identify positively all the species described by these gentlemen except *Trimerotropis thalassica* Bruner. Of the comparatively few species described by Saussure and other European students of the order, though the types have been inaccessible, identification has in nearly all cases been satisfactorily made through collections made in the localities from which these species were first described. For this and other material, which has been the most important aid I have received, I am greatly indebted to Dr. Bruner. I am also under great obligations to the authorities of the U. S. National Museum for free access to its collections upon which this paper is based, and for materials placed in my hands for use in the preparation of this paper. I am similarly indebted to the Leland Stanford Junior University.

I have made no attempt to give complete synonomy of the species, but have usually contented myself with references to papers containing specific descriptions.

In naming the veins I have adopted Redtenbacher's terminology as modified by Comstock, as a study of the tracheation and venation of *Orthoptera*, on which I have been engaged for several months, has convinced me that it is possible to determine with almost complete certainty what these homologies are, and it is desirable from every standpoint that one system of names should be employed in all the orders. It should be noted, however, that while the homology of the main veins and branches is established to my satisfaction, there is still uncertainty about the homology of the branches in some cases, and I have thought best to enumerate the branches of R_s in the tegmina as simply accessory branches instead of the primitive forks which some of these branches should represent. In speaking of the regions of the tegmina and wing, to which it is convenient to refer in diagnoses, I have divided these organs into three fields, as follows: "*Anterior*," in front of R_1; "*middle*," between R_1 and *1st A*; "*posterior*," behind *1st A* (Plate XXI, fig. 4). The term area has been applied to the part of a field immediately posterior and adjacent to a vein or a named branch, and it bears the name of this vein or branch, as, for example: Area *M* lies behind *M* in the basal half of the tegmina or wing, while area M_1 lies between M_1 and M_3 in the distal half of the wing or tegmina (Plate XXI, figs. 1 and 2). Spurious veins, as *I*, and unnamed veins (Plate XXI, fig. 3, *I* and *S*) do not give names to the areas which they precede.

The term "cell" retains the meaning, given to it in the other orders, of a portion of the tegmina or wing bounded by veins or veinlets.

The term interplical ridge has been applied to the summit of the radial convexities of the wing and interplical groove the bottom of the alternating concavities. (Fig. 4, *R* and *G*.) For convenience the branches of *2d* and *3d A* in Plate XXI the wing have been referred to as radiate veins.

In indicating the relationship of *Trimerotropis* to the allied genera it has been necessary to characterize two new genera. *Metator* is based upon *Mestobregma pardalina* Saussure and will probably include *Mestobregma maculosa* Saussure. *Trepidulus* has for its type a new species from San Bernardino, California (Coquillet collection), which may be called *Trepidulus rosaceus*.

KEY TO THE SPECIES OF TRIMEROTROPIS.

*A*¹. Tegmina plain isabelline, not banded and with spots not segregated into groups extending across the wing. Frontal costa[1] sulcate as strongly above as below the ocellus, its carinæ continuous with the carinæ of the vertex. Pronotum with the disk flat. Area of the cubital forks narrow and with few exceptions occupied wholly or in part by a single row of quadrate cells. Wings always long with the disk greenish yellow or hyaline throughout. Posterior tibiæ never blue.
Agonozoa, new subgenus.

- *a*¹. Lateral lobes of the pronotum with a dentation on the posterior part of the lower border.
  - *b*¹. General color pale testaceous, very plain. Wings transparent without a trace of a fuscous band. Tegmina without bands and with a very few spots restricted almost entirely to the middle field. Posterior femora light on the inner face with the usual black bands obeolete .... HYALINA GROUP.
    hyalina, new species
  - *b*². General color isabelline. Wings with a definite fuscous band, or at least with plain indications of such a band in the infuscated nerves of the region usually occupied by the band. Pronotum with a definite stripe extending along the sides of the disk, or at least with the edges lighter than the middle.
    TEXANA GROUP.
    - *c*¹. Prozone of the pronotum bilobate when seen from the side. Median carina a raised line on the metazone.
      - *d*¹. Process of the metazone acute angulate. Metazone twice as long as the prozone. Fuscous band of the wings broad. Posterior tibiæ dull orange .... *texana* Bruner.
      - *d*². Process of the metazone obtuse angulate. Metazone not more than one and three-quarter times as long as the prozone. Posterior tibiæ obscure greenish.
        - *e*¹. Smaller, male 15 mm., female 22 mm. long. Crest of the prozone divided into dentiform lobes .... *rebellis* Saussure.
        - *e*². Larger, 19 to 23 mm., female 27 to 30 mm. long. Crest of the prozone divided into rounded lobes.

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[1] *Trimerotropis coquilletti* has the frontal costa mostly solid above the ocellus.

f^1. Posterior lobe of the crest of the prozone plainly not so high as it is long. Posterior femora very distinctly banded on the outer face, lower sulcus light-colored with two black bands. *albolineata* Bruner.

f^2. Posterior lobe of the crest of the prozone as high as it is long. Posterior femora indistinctly banded on the outside, lower sulcus black with two light bands .....*cristata*, new species.

c^2. Prozone of the pronotum not bilobate when seen from the side and barely intersected by the sulcus, and therefore straight and barely perceptably notched. Median carina cristate on the metazone and nearly as high as on the prozone..*porrecta*, new species.

a^2. Lateral lobes with no dentation on the posterior part of the lower border, or if there is a blunt tooth present, the fuscous band is weak or interrupted and the pronotum has no definite stripe along the lateral edges of the disk nor is the middle darker than the lateral borders......................MARITIMA GROUP.

b^1. Area of the cubital forks of the tegmina occupied by more than one row of irregular cells.

c^1. Wings with the median and cubital areas about equal. Larger, male 26 mm., female 34 mm. long. North American....*maritima* Harris.

c^2. Wings with the median and cubital areas very unequal. Smaller, male 22 mm., female 28 mm. long. Chilean. *ochraceipennis* Blanchard.

b^2. Area of the cubital forks of the tegmina narrow, occupied by a single row of subquadrate cells. Lower sulcus of the posterior femora black with a single preapical light band.

c^1. Median carina on the metazone somewhat cristate. Fuscous band of the wings indicated only by infuscated veins, or at most incomplete and continued on the posterior margin less than half way to the anal angle; spur extending more than half way to the base ....*gracilis* Thomas.

c^2. Median carina on the metazone distinct but merely a raised line. Fuscous band of the wings distinct and uninterrupted, continued on the posterior border much more than half way to the anal angle; spur extending less than half way to the base. *coquilletti*, new species.

A^2. Tegmina fasciate, with solid well-defined bands reaching at least half way across the wing from the anterior margin, or by the segregation of annular spots, fascia sometimes faint on account of the slight contrast between them and the ground color. Rarely the tegmina are not fasciate, then they are evenly maculate with fuscous annuli and the wings are broad with the apical half fuscous or fuliginous. Frontal costa generally sulcate above the ocellus for a short distance only, below the vertex rounded and punctate. Pronotum with the disk usually elevated and subtectiform on the prozone. Area of the cubital forks broad, occupied by several rows of irregular cells......................... TRIMEROTROPIS subgenus.

a^1. Wings with the disk yellow or green, never blue, and never without a fuscous band or cloud.

b^1. Hind tibiæ never blue. Tegmina with the basal and median bands solid, approximately equal to each other and to the light bands just beyond with which they alternate, and confined to a little more than the anterior half..........CINCTA GROUP.

c^1. Front of the head with two black bands extending between the eyes, one above and one below the basal joint of the antennæ. *cincta* Thomas.

c^2. Front of the head with no black bands extending between the eyes. *juliana* Scudder.

b^2. Hind tibiæ frequently blue. Tegmina not as in the alternative.

c^1. Tegmina[1] fasciate through the uneven distribution of maculations or by well-defined clouds or bands. If the tegmina are the first kind then the outer half of the wing is not infuscated and the lower sulcus of the hind femora is not black with a single preapical light band.

d^1. Posterior tibiæ blue.............................. CAERULEIPES GROUP.

e^1. Lateral lobes of the pronotum with the posterior angle rounded, without a downward projecting tooth. Disk of the wings greenish or yellow.

f^1. Lower sulcus of the posterior femora black with a single preapical light band.

g^1. Wings with the apical half hyaline, neither fuscous nor fuliginous except at the extreme tip. Bands of the tegmina plainly formed by the aggregation of smaller maculations. *caeruleipes* Scudder.

g^2. Wings with the apical half fuliginous and fuscous, nowhere entirely hyaline. Basal and median bands solid and well defined, at least on the anterior half.

h^1. General color light, punctate with fuscous. Tegmina conspicuously fasciate and punctate with fuscous. Disk of the wings semiopaque, yellowish green, beyond mostly fuscous. *tessellata*, new species.

h^2. General color fuscous, nearly plain. Tegmina plain fuscous with two pale bands. Wings with the disk transparent greenish yellow, beyond mostly fuliginous. *calignosa*, new species.

f^2. Lower sulcus black with two light bands on the apical half, or (through the fading of the fuscous base) light with one preapical black band.

g^1. Ground color white. Tegmina white with three narrow black bands. Scutellum of the vertex very shallow with a very indistinct median carina ....*albescens*, new species.

g^2. Ground color brown or gray, never white, and with only the basal and median bands well defined.

h^1. Scutellum of the vertex with a median carina. Posterior field of the tegmina not plain, with spots or fascia.

i^1. Bands of the tegmina not weakening posteriorly, in the posterior field not broken up into spots. Scutellum of the vertex no longer than broad, even in the male. *bifasciata* Bruner.

i^2. Bands of the tegmina weakening posteriorly, in the posterior field broken up into spots. Scutellum of the vertex much (male) or a little (female) longer than broad. *ferruginea*, new species.

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[1] *Trimerotropis agrestis* with a broad fuscous band and red hind tibiæ must be included here, though the tegmina are almost destitute of spots.

h^2. Scutellum of the vertex deeply sulcate, with no median carina. Posterior field plain, without spots or fascia..*koebelei* Bruner.

e^2. Lateral lobes of the pronotum with the posterior angle furnished with a minute, downward projecting tooth. Disk of the wings sea-green..............................*thalassica* Bruner.

d^2. Posterior tibiæ red or orange.

e^1. Lateral lobes of the pronotum without a tooth on the posterior part of the lower border.

f^1. Scutellum of the vertex moderately broad, but plainly less than the short (male) or long (female) diameter of the eye. Posterior femora with the disk of the inner face yellow or red, with three black bands, one apical, one preapical, and one median. The latter may extend, as a stripe, toward the base, but the immediate base is very rarely black. Rarely the whole inner face may be suffused with fuliginous, obscuring the markings ....CITRINA GROUP.

g^1. Disk of the metazone of the pronotum plainly lighter than the prozone, generally reddish brown in color, and smooth, except for a few large, scattered, generally black granules. Posterior femora chiefly red on the inner side.

h^1. Lower sulcus, as well as the inner face, chiefly red, with no fuliginous suffusion obscuring the fuscous bands or spots.
monticola Saussure.

h^2. Lower sulcus of the posterior femora black or fuliginous. Median carina slight but distinct.
campestris Bruner, manuscript.

g^2. Disk of the metazone not as in the alternative.

h^1. Median and basal bands of the tegmina solid and not plainly formed by the grouping of spots.

i^1. Bands of the tegmina conspicuous.

j^1. Process of the metazone acute.

k^1. Median carina of the scutellum of the vertex distinct.
bruneri, new species.

k^2. Median carina wanting............*fascicula*, new species.

j^2. Process of the metazone decidedly obtuse.
praeclara, new species.

i^2. Bands of the tegmina dim. Color testaceous, plain. Metazone with its process acute ....*modesta* Bruner.

h^2. Median and basal bands of the tegmina obviously made up of fuscous annuli. Process of the metazone obtuse.
citrina Scudder.

f^2. Scutellum of the vertex equaling the short (male) or long (female) diameter of the eye. Posterior femora with the disk of the inner face black with one or two light bands on the apical half. Fuscous bands of the wings at least one-fourth the length of the wings in width.........LATIFASCIATA GROUP.

g^1. Posterior femora with two light bands on the inner face. Process of the metazone obtuse angulate with the tip rounded.

h^1. Median carina of the scutellum of the vertex wanting. Median carina of the metazone of the pronotum elevated and very distinct..............................*latifasciata* Scudder.

h^2. Median carina of the scutellum of the vertex distinct. Median carina of the pronotum nearly obsolete on the metazone.
laticincta Saussure.

g^2. Posterior femora with one light band on the inner face. Process of the metazone of the pronotum acute angular with the tip sharp.

h^1. Basal half of the wings yellow.

i^1. Outer half of the wings infuscated ....*tolteca* Saussure.

i^2. Outer half of the wings not wholly infuscated, but the apical hyaline part nearly as broad as the fuscous band.
pistrinaria Saussure.

h^2. Basal one-sixth of the wings yellow, apical one-sixth hyaline, remaining two-thirds occupied by the fuscous band.
melanoptera, new species.

e^2. Lateral lobes of the pronotum with a tooth on the posterior part of the lower border.......................CALIFORNICA GROUP.

f^1. Tegmina conspicuously banded, or at least with the fuscous punctations well separated into three groups.

g^1. Pronotum with a light stripe on either side of the disk. Fuscous band of the wings narrow, about one-seventh of the length of the wing in width ....*californica* Bruner.

g^2. Pronotum quite plain on the disk. Fuscous band of the wings broader, one-sixth or one-fifth the length of the wing in width.

h^1. Metazone of the pronotum twice as long as the prozone, with the process acute angulate ....*strenua*, new species.

h^2. Metazone of the pronotum once and a half as long as the pronotum with the process obtuse angulate.
montana Bruner, manuscript.

f^2. Tegmina with scarcely a trace of the usual bands, but with a few scattered spots on the basal half, the rest almost plain.
agrestis, new species.

d^3. Posterior tibiæ yellow-green or brown.

e^1. Lateral lobes of the pronotum with a tooth on the posterior part of the lower margin ....PACIFICA GROUP.
pacifica Bruner.

e^2. Lateral lobes of the pronotum without a tooth. Tegmina distinctly or conspicuously banded, except sometimes in dark colored specimens where the contrast may be slight; fascia large and, though irregular in shape, semisolid and something more than aggregations of fuscous spots. Wings yellow or greenish yellow at the base with a distinct fuscous band. Posterior femora with the disk of the inner face black with two light bands ....VINCULATA GROUP.

f^1. Lower sulcus of the posterior femora light, with one preapical black band, or black, with two light bands, one preapical and one median, the latter not merely interrupting the black on the edges of the sulcus, but in the bottom as well.

g^1. Fuscous band in its usual position in the middle of the wing. Spur extending less than half way to the base. General color dark fuscous brown, permitting little contrast in the bands of the tegmina.

h^1. Metazone scarcely more than one and a half times as long as the prozone. Fuscous band of the wings very broad, occupying nearly one-third the length of the wings.
salina Bruner, manuscript.

h^2. Metazone twice as long as the prozone. Fuscous band rather narrow, occupying no more than a sixth or seventh of the length of the wings .... *similis* Scudder.

g^2. Fuscous band entirely beyond the middle of the wing, making the length of the disk equal to the width. Fuscous spur extending more than half way to the base. Bands of the tegmina contrasting strongly with ground color and very conspicuous.................... *pallidipennis* Burmeister.

f^2. Lower sulcus of the posterior femora black, with one preapical light band.

g^1. Posterior tibiæ yellow or greenish, never brown.

h^1. Pronotum unusually short, not (male), or a very little (female) longer than wide. Size small, less than 20 mm. (male) or about 25 mm. (female) .... *collaris*, new species.

h^2. Pronotum not unusually short, considerably longer than wide even in the female.

i^1. Fuscous band very narrow and interrupted; spur acute, extending more than half way to the base. Process of the metazone acute. Size small, 20 mm. (male), 25 mm. (female). *fratercula*, new species.

i^2. Fuscous band broad, or when narrow distinct and uninterrupted.

j^1. Metazone twice as long as the prozone with the process acute. Wings long, barely less than twice as long as wide. Fuscous band narrower, at most not exceeding one-sixth the length of the wing. Lower sulcus of the posterior femora with the black not almost severed by the median light band ....*vinculata* Scudder.

j^2. Metazone less than one and three-quarter times as long as the prozone, with the process rectangular. Wings shorter, being considerably less than twice as long as wide. Fuscous band equal in width to a fourth or a fifth the length of the wing. Lower sulcus of the posterior femora with the black almost severed by the median light band. *saxatilis*, new species.

g^2. Posterior tibiæ brown with a pale subbasal annulus. Size small. Wing very broad, less than one and one-half times as long as broad ....*pilosa*, new species.

c^2. Tegmina thickly punctuate with evenly scattered fuscous annuli, contrasting little with the fuscous background and not, or very rarely, collected into groups forming bands. Wings broad with the outer half infuscated or fuliginous; rarely only the tip of the apical part and the veins beyond the fuscous band are infuscated ....FALLAX GROUP.

d^1. Posterior tibiæ blue, with a light subbasal annulus or at least a brownish spot on the exterior face.

e^1. Tegmina evenly maculate with, at the most, faint traces of bands. Process of the metazone acute angulate, at least in the male. *fallax* Saussure.

e^2. Tegmina plainly fasciate by the unequal distribution of fuscous annuli. Process of the metazone obtuse-angulate even in the male. *nubila*, new species.

d^2. Posterior tibiæ not blue and without a pale subbasal annulus.

e^1. Portion of the wing beyond the fuscous band either fuscous or fuliginous, spur reaching half way to the base.
conspersa, new species.

e^2. Portion of the wing beyond the fuscous band hyaline, spur reaching two-thirds the distance to the base ..*variegata*, new species.

a^2. Wings entirely hyaline without fuscous band and colored disk, or the latter blue with the fuscous band distinct or indicated by infuscated nerves and cells. Fascia of the tegmina never solid but obviously made up of fuscous annuli often imperfectly segregated.

b^1. Fuscous band present. Disk blue. Posterior tibiæ blue, with a light subbasal annulus ......................CAERULEIPENNIS GROUP.

c^1. Prozone of the pronotum strongly elevated and bilobate. Disk of the wings faintly tinged with blue. Fuscous band narrow and indistinct .... *caeruleipennis* Bruner.

c^2. Prozone of the pronotum very little elevated and scarcely bilobate. Disk of the wings deep blue. Fuscous band broad and distinct.
cyaneipennis Bruner.

b^2. Fuscous band wanting. The wing entirely hyaline. Posterior tibiæ obscure greenish or brown. Posterior femora with the disk of the inner face black with two light bands on the apical half. Lower sulcus light with one preapical black band.
AZURESCENS GROUP.

c^1. Scutellum of the vertex broad, scarcely longer than broad and about equal in width to the diameter of the eye as seen from above. Process of the metazone acute .... *azurescens* Bruner.

c^2. Scutellum of the vertex narrow, plainly longer than broad and much less than equal in width to the diameter of the eye as seen from above.

d^1. Process of the metazone rounded. Basal fuscous band distinct from the fuscous points of the immediate base. Larger, male more than 20 mm. long .... *pseudo fasciata* Scudder.

d^2. Process of the metazone sharp. Basal fuscous band of the tegmina not distinct from the spots of the immediate base. Smaller, male less than 20 mm. long .... *lauta* Scudder.

HYALINA group.

Testaceous, entirely plain except for a few spots on the tegmina. In size and appearance much resembling *Conozoa behrensi*, but with most of the characteristic features of that genus weakened or wanting. It, however, forms the connecting link between that genus and *Trimerotropis*. Scutellum of the vertex wide, about equal to or not much less in width than the short diameter of the eye; median carina very slight. Pronotum with the metazone one and a half times as long as the prozone, with the process very obtuse angulate; lateral lobes with a strong tooth on the posterior part of the lower border. Posterior femora with the inner face light, with the usual dark bands much weakened or wanting.

TRIMEROTROPIS HYALINA, new species.

Robust, pale testaceous, almost plain, with a few scattered spots in the middle field of the tegmina occupying the usual position of the fuscous bands; anterior and posterior fields plain except for exceedingly faint spots near the base.

Scutellum of the vertex moderately deep, with faint median carina, as wide as the short diameter of the eye which is considerably shorter than the genal groove. Pronotum with the prozone elevated, median carina high and strongly bilobed; metazone one and a half times as long as the prozone, with the disk smooth and the process strongly obtuse angulate, its sides straight and tip rounded; lateral carinæ obsolete, except upon the front of the metazone and prozone; lateral lobes with a strong tooth on the posterior part of the lower border. Wings entirely transparent and faintly tinged with yellow; fuscous band entirely wanting, and none of the veins or veinlets are infuscated except at the extreme tip of the wing. Posterior femora with the disk of the inner face pale, with scarcely a trace of fuscous band, lower sulcus pale, outer face testaceous, obscurely fasciate. Posterior tibiæ obscure yellow.

Length of body, female, 30 mm.; length of tegmina, 30 mm.; length of posterior femora, 18 mm.

Type.—Cat. No. 5370, U.S.N.M.; one female, California. Determined by Uhler as *Trimerotropis pseudofasciata*, to which it is not very closely related. In size, general proportions, and color (except for the very different tegmina and wings) it resembles *Conozoa*, to which it is much more closely related than *Trimerotropis cincta* and *juliana* are.

TEXANA group.

Size medium, color dark gray varied with yellow or white, with broad light stripes (sometimes indistinct but always traceable) extending from the eyes along the edge of the disk to the posterior border of the pronotum, no definite bands on the tegmina, but some indication of these in their usual position; veins in the apical portion infuscated and generally bordered with fuscous which extends out on the cross veins. Head considerably or much elevated. Frontal costa sulcate above the ocellus as well as below with the carinæ continuous with those of the vertex; scutellum of the vertex deeply sulcate, somewhat (female) or considerably (male) longer than broad, the length being increased by the inclusion of the median foveolæ which are well impressed; lateral foveolæ equally distinct; antennæ in the male about equaling the posterior femora. Pronotum with the disk flattened and lateral carinæ absent at least between the sulci; median carinæ cristate at least on the prozone; metazone with its disk smooth; lateral lobes with a tooth on the lower posterior border. Tegmina with the last branch of the radial sector distant from the fork by about one-fourth (female) or one-third (male) the length of the sector; medial and cubital forks fused for a short distance; intercalary vein separated apically from the median by once (male) or several times (female) its own width; area of the cubital forks narrow. Wings moderately long, but distinctly less than twice as long as broad, with a distinct moderately broad fuscous band at least a sixth of the length of the wings in width continued on the posterior border not more than halfway; spur extending about halfway to the base; apex clear with the tip more or less infuscated, the fuscous markings showing a tendency to follow the main veins.

This group includes four closely allied species which show in the markings and structure a distinct tendency to *Derotmema.*

TRIMEROTROPIS TEXANA Bruner.

Conozoa texana Bruner, Proc. U. S. Nat. Mus., XII, 1890, p. 65.—Townsend, Insect Life, VI, 1893, p. 30.

Slender, especially in the male, with various shades of brown and white commingled, a whitish spot in the middle of the lateral lobes of the pronotum and a rather indistinct yellowish stripe extending from the principal sulcus above the white spot downward in a curve to the base of the mandibles. Scutellum of the vertex narrow with no (male) or a distinct (female) median carina; eye equal to (male) or distinctly less than (female) the genal groove. Pronotum with the median carina only slightly cristate and bilobate on the prozone, scarcely more than a raised line, equal throughout on the metazone; lateral carinæ entirely wanting except on the anterior of the metazone of the female; metazone twice as long as the prozone with the process acute, its margins straight and tip sharp. Tegmina mainly isabelline, but with a distinct lightening in those areas usually occupied by the light bands. This is more apparent and conspicuous on the anterior field. Wings opaque yellowish green at the base, with a rather broad, distinct fuscous band; apex hyaline with fuscous margining the principal veins more or less on the first and second lobes. Posterior femora with the disk of the inner face and the lower sulcus black with two light bands on the apical half, outer face three black bands, the two proximal ones oblique; posterior tibiæ dull orange with a light subbasal annulus.

Length of body, male 22 mm., female 27 mm.; length of tegmina, male 24 mm., female 30 mm.; length of posterior femora, 12.5 mm.

One male (type), El Paso, Texas, G. W. Dunn, collector; one female, Las Cruces, New Mexico, Townsend, collector; Bruner collection.

TRIMEROTROPIS REBELLIS Saussure.

Conozoa rebellis SAUSSURE, Add. Prodr. Oedip., 1888, p. 60.

This species is unknown to me, as I have not been able to identify it satisfactorily among the species I have examined, and the types are inaccessible. Saussure's description is appended.

Slender, compressed, fulvous, varied with fuscous and white. Antennæ rather long and slender. Head narrow, compressed. Facial costa subparallel, sulcate. Scutellum of the vertex pear-shaped, narrow, with the apex foveolate. Lateral foveolæ triangular, not elongate. Pronotum anteriorly attenuate and granulate. Prozone rather strongly cristate, when seen from the side strongly bidentate or bilobate, as in the genus *Trachyrrhacis*. Metazone scarcely rugulose, in the female transverse, obtuse angulate, carinate, with the lateral carinæ acute. Lateral lobes with the lower angle led into a tooth with margin behind the angle arcuate. Tegmina narrow, peculiarly sprinkled with fuscous, everywhere fuscopunctulate; costal margin with a fuscous spot at the base and in the middle; middle field with three to four elongate fuscous spots, the last frequently fading near the radial vein. Basal half densely reticulate; intercalary closely approaching the median vein; apical part quadrate reticulate. Wings sulphur yellow at the base, with the fuscous band not continued upon the posterior margin, anteriorly scarcely narrowed and sending toward the base an incomplete stripe; anterior margin beyond the band black. Apical part hyaline, reticulate with fuscous or with fuscous lines and spots. Outer posterior margin somewhat sinuate. Posterior femora with three black bands on the inner and the outer face; white on the lower part of the outer face. Posterior tibiæ bluish. Cheeks and sides of the pronotum fasciate or spotted with white; pronotum sometimes with five fuscous stripes and the meso and metapleura with two white stripes.

Length of body, male 15 mm., female 22 mm.; length of tegmina, male 18.5 mm., female 22 mm.

California (Bruner collection, No. 9727).

TRIMEROTROPIS ALBOLINEATA Bruner.

Conozoa albolineata BRUNER, Proc. U. S. Nat. Mus., XII, 1890, p. 66.

A graceful and slender species, recalling the male of *Syrbula admirabilis*. In addition to the markings common to the group which are all present in increased strength in this species, it has three parallel fuscous stripes on the occiput, one behind each eye extends across the upper edge of the lateral lobes of the prozone, two fuscous preceded by two white stripes on the meso and metathorax and a white stripe running along the genal groove, and this followed by a fuscous streak. Head more strongly elevated than in any species of the genus, in this and many other respects strongly resembling *Derotmema*.

Eyes as long (female) or a little longer (male) than the genal groove; antennæ long in both sexes, scarcely exceeding the posterior femora. Pronotum with the disk moderately high and bilobate on the prozone, linear on the metazone; lateral carinæ nearly obsolete even on the metazone and front of prozone, metazone one and a half (male) or one and three-quarter (male) times as long as the prozone, process very obtuse-angulate, sides straight and tip sharp. Tegmina with the middle and posterior fields nearly entirely infuscated, anterior field yellow or whitish with a single basal spot of fuscous at the point of greatest width near the base. Wings as in other species of the group.

Posterior femora with three or four dark bands on a light ground on the inside, lower sulcus light with two dark bands, exterior face very distinctly marked with alternate white or light and fuscous oblique bands. Posterior tibiæ, obscure greenish. Length of body, male 19 mm., female 28 mm.; length of tegmina, male 19 mm., female 29 mm.; length of posterior femora, male 10 mm., female 15 mm.

One male, Los Angeles, California, Coquillett, collector. One male, Los Angeles, California, Koebele, collector, Bruner collection. Numerous specimens, Ontario, California, June, Snodgrass, collector. Museum of Stanford University.

TRIMEROTROPIS CRISTATA, new species.

Closely related to *Trimerotropis texana*, from which it may be distinguished by the following characters:

Color as in that species, but with a reddish tinge sometimes replacing fuscous gray. Scutellum of the vertex deep, with a distinct median carina; eyes decidedly shorter than the genal grooves. Pronotum with the median carina very strongly cristate on the prozone, and equally distinctly bilobate, the first lobe being one-half and the second fully as high as long; on the metazone a slight but distinct raised line. Lateral carinæ present only on the front of the metazone; the latter little more than once and a half as long as the prozone, with the process strongly obtuse-angular, the margins straight, and the tip rounded. Tegmina with the light area prevailing in the anterior and posterior fields and about equaling the dark in the middle field. Wings as in that species, but transparent and faintly tinged with yellowish green on the disk, with the fuscous band narrower and scarcely at all continued on the posterior border toward the base. Posterior femora as in that species, but with the black deeper and more extensive on the inner face and lower sulcus, and less distinct on the outer face. Posterior tibiæ obscure yellow, with no subbasal annulus. Length of body, female, 26–29 mm.; length of tegmina, 27–28 mm.; length of posterior femora, 13½ mm.

One female, San Julio, Lower California, Charles D. Haines, collector, April; one female, 4,300 feet, Salt Lake Valley, Utah, August 1 to 4, Bruner collection.

This species has been mistaken for *Conozoa sulcifrons*, but it is very unlike that species as I recognize it, and certainly does not answer to Saussure's description.

TRIMEROTROPIS PORRECTA, new species.

Similar to *Trimerotropis texana*, but smaller and distinct in the following respects:

Pronotum with the median carina very strongly cristate on the metazone as well as the prozone, in this respect agreeing well with *Conozoa*, on the latter not lobate and hardly perceptibly intersected, in this particular agreeing with *Spharageman;* lateral carinæ entirely obsolete; anterior margin strongly angulate; metazone one and a half times as long as the prozone, with its disk rugose with elongate granulations, process of the metazone acute angulate, the margins slightly sinuate and tip sharp. Tegmina rather evenly infuscated with dusky annuli in the middle and posterior fields, with a light indefinite stripe along the anal vein; anterior field almost entirely occupied by two broad distinct fuscous bands, each preceded by a small quadrate yellow spot. Wings as in the preceding species. Posterior femora as in *texana*. Posterior tibiæ yellow without a pale annulus. Length of body, male, 18 mm.; length of tegmina, 20 mm.; length of posterior femora, 10 mm.

One male, California, Koebele, collector, Bruner collection. This species has also been mistaken for *Conozoa sulcifrons*, doubtless on account of the uninterrupted crest of the prozone. It does not, however, at all resemble that species, and is a consistent member of the *texana* group, though it is difficult to determine its nearest relative on account of the peculiar structure of the pronotum.

MARITIMA group.

Size, medium or large; color, dull brown, plain or isabelline with no bands on the tegmina, and spots when present showing no tendency to arrange themselves in bands. Scutellum of the vortex about as broad as long, in the males apparently somewhat longer by the inclusion of the median foveolæ; frontal costa distinctly and strongly sulcate above the ocellus, its lateral carinæ often continuous with those of the vertex; eyes about equal (male) or much less (female) than the genal grooves; antennæ long but not exceeding the posterior femora even in the male. Pronotum with the median carina slightly cristate on the prozone; disk flat with the shoulders well marked and the lateral carinæ not entirely wanting; metazone about twice as long as the prozone, lateral lobes with the margins well rounded or if a slight tooth is present then plainly sinuate on the anterior half. Tegmina long. Wings with the fuscous band narrow, distinctly less than one-sixth the length of the wings in width. Posterior tibiæ obscure.

This group includes three well-marked species, each of which, in addition to characteristics possessed in common with the others which recall *Conozoa*, varies independently in that direction. *Maritima*, for instance, in some specimens, has the lateral lobe very nearly as in that genus. *Coquilletti* has the areas of the cubital forks so simplified that it contains only about four quadrilateral cells at one end, the rest being hyaline without cross veins. *Grocilis*, in some specimens, has the median carina cristate on the metazone and as high as that of the prozone. Each of these, then, has a character belonging (but not peculiar) to *Conozoa*, as I have defined it, but, since they vary independently, each has two characters of *Trimerotropis* to the one of *Conozoa*. If these three species, then, should be included in *Conozoa*, nearly one-half of the characters I have been able to find to characterize that genus would become nearly useless. If we further take away the characters of *Conozoa* which they lack, the pattern of tegmina and the elongate scutellum, we should have nothing left peculiar to the group but the "lateral carinæ well developed" and the "frontal costa sulcate above the ocellus." But the first group culminates in a species in which the lateral carinæ of the prozone are completely broken down, so that nothing would be left peculiar to the group but "frontal costa sulcate," and this will hardly do to found a genus on. But it would not only be impracticable to retain these groups (and they are too closely related to include one and not the other), but it would be illogical. *Texana* and *hyalina* have been varying in different directions, and each is much more nearly related to a typical *Trimerotropis*, like *cœruleipes*, than it is to the other. These groups, then, must be retained in *Trimerotropis*, or at least removed from *Conozoa*, and, while not as distinct as genera should be, they may be considered to form a subgenus.

TRIMEROTROPIS MARITIMA Harris.

Locusta maritima Harris, Rept. Ins. Inj. to Veg., 1841, p. 178.

Oedipoda maritima Uhler, Treat. Ins. Inj. to Veg., 1862, p. 178.—Scudder, Mat. Mon. N. Am. Orth., 1862, p. 472.—S. I. Smith, Rept. Ent. Conn., 1872, p. 373.—Thomas, Acrid. of N. Am., 1873, p. 124.

Trimerotropis maritima Stål, Recen. Orth., I, 1873, p. 135.—Scudder, Dist. of Ins. in N. H., 1874, p. 378.—Thomas, Ninth Rept. Ent., Ill., 1880, p. 113.—Saussure, Prodr. Oedip., 1884, p. 172.—Fernald, Orth. of New Eng., 1887, p. 45.—Davis, Ent. Am., V, 1889, p. 81.—McNeill, Psyche, VI, 1891, p. 64.—J. B. Smith, Bull. 90, N. J. Agr. Exp. Sta., 1892, p. 34.—Morse, Psyche, VII, 1894, p. 105.—Blatchley, Can. Ent., XXVI, 1894, p. 218.—Beutenmüller, Bull. Am. Mus. Nat. Hist., VI, 1894, p. 299.—Blatchley, Proc. Ind. Hort. Soc., 1896, p. 21; Can. Ent., XXX, 1898, p. 61.

Size medium or large, color isabelline and plain on the front and sides of the head, the lower part of the sides of the thorax and abdomen as well as the legs more or less white. Scutellum only moderately infuscate with the sides considerably elevated and continuous with the carinæ of the frontal costa; median foveolæ almost obsolete, lateral foveolæ well impressed, antennæ long. Pronotum with the median carina low and scarcely cristate even on the prozone, lateral carinæ very variable either obsolete, except on the front edge of the prozone or more or less developed throughout; metazone about twice as long as the prozone with the disk smooth and the process obtuse angulate, its margins slightly sinuate and tip sharp; lateral lobes with the posterior angles rounded, or with a slight tooth, but then the lower margin is strongly sinuate anteriorly. Tegmina isabelline without bands, sometimes faintly clouded on the basal half; last branch of the radial sector distant from the fork only a little less than half the length of the sector; intercalary vein distant apically from the median by more than (male) or several times (female) its width; cubital and median forks free or united by a cross vein; area of cubital forks filled by several rows of irregular cells. Wings long, twice as long as wide with the apex attenuated; disk faintly yellow with a fuscous band of variable width, but never as much as one-sixth the length of the wing, continued but a little way on the posterior border, spur extending about half way to the base; apex hyaline. Posterior femora pale on the inside, with traces of three dark bands, lower surface pale, outer side without distinct bands. Posterior tibiæ obscure sometimes with a white sub-basal cloud on the outer side.

Length of body, male, 24 mm., female, 34 mm.; length of tegmina, male, 25 mm., female, 35 mm.; length of posterior femora, male, 13 mm., female, 17 mm.

Atlantic States, from Virginia northward and along the shores of the Great Lakes west to Illinois.

TRIMEROTROPIS OCHRACEIPENNIS Blanchard.

Oedipoda ochraceipennis BLANCHARD, in Gay, Hist. Fisic de Chile, Zool., VI, 1851, p. 77.

Oedipoda cinerescens BLANCHARD, in Gay, Hist. Fisic de Chile, Zool., VI, 1851, p. 78.

Oedipoda placida STÅL, Freg. Eng. Resa, Ins. Orth., 1860, p. 344.

Trimerotropis placida STÅL, Recen. Orth., I, p. 134.—SAUSSURE, Prodr Oedip., 1884, p. 172.

I have been unable to recognize this species among any of the forms I have seen. I append Saussure's description:

> Very similar to *Trimerotropis maritima*, but smaller, with the head and pronotum rugulose; vertex rugulose; lateral foveolæ elongate or triangular. Pronotum densely punctate; crest of the prozone rather prominent and strongly bilobate, with the lobes inclined backward; disk of the metazone granulate, distinctly carinate. Tegmina fusco- trifasciate. Wings with the disk sulphurous, with a narrow arcuate fuscous band composed of separate clouds, vanishing upon the posterior margin; two posterior areas (median and cubital) of the anterior lobe very unequal. Posterior femora a little swollen, banded-var—*a*, axillary vein of the tegmina confluent with the anal; *b*, fuscous band of the wing continuous (*Ochraceipennis* Blanchard); *c*, fuscous band in separate spots (*Signatipennis* Blanchard).

Length, male, 22 mm.; female, 28 mm.; tegmina, male, 26 mm., female, 31 mm.

In coloration very similar to *Trimerotropis maritima*, but smaller. and distinct from that in the different venation of the wings.

Saussure in his conspectus of the species of *Trimerotropis* includes this in the groups having blue (*maritima* is also in this group, so his blue probably means any color but red, the other alternative) hind tibiæ.

Chile, South America, Saussure.

TRIMEROTROPIS GRACILIS Thomas.

Œdipoda gracilis THOMAS, Geol. Surv. Terr., 1871, p. 461; Acrid. of N. Am., 1873, p. 121.

Trimerotropis gracilis SAUSSURE, Prodr. Œdip., 1884, p. 171.

Size medium or large; color dull grayish brown. Scutellum with the median carina slight but distinct. Pronotum with the median carina somewhat cristate on the metazone; lateral carinæ distinct, except between the sulci. Metazone scarcely twice as long as the prozone, with the process slightly obtuse or acute angulate, the margins straight and the tip sharp. Tegmina plain, except for an indefinite cloudiness basally and irregular and broken linear infuscations of the principal veins and their branches; last branch of the radial sector distant from the fork one-third (male) or one-fourth (female) the length of the sector; intercalary vein separated apically from the median by scarcely more than its own width; cubital and median veins free or connected by a short cross vein; area of the cubital forks narrow, occupied, basally at least, by a single series of quadrate cells. Wings long, twice as long as wide, scarcely attenuate at the apex; disk faintly greenish yellow, followed by a narrow fuscous band much broken and indistinct, often indicated by a darkening of the veins merely, continued for a very short distance on the posterior border, spur extending much more than half way to the base; apex hyaline, with the extreme tip sometimes slightly infuscated, but generally all the veins and cross veins are darkened. Posterior femora black, with two light bands on the apical half; lower sulcus black, with one light preapical band; outer surface plain or obsoletely banded. Posterior tibiæ brown, without any subbasal annulus.

Length of the body, male, 21 mm., female, 24 to 30 mm.; length of the tegmina, male, 22 mm., female, 25 to 30 mm.; length of posterior femora, male, 10½ mm., female, 12 to 14 mm.

One male, one female, Birch Creek, Idaho, August; one female, Salt Lake Valley, Utah. Bruner collection: One female, Salmon City, Idaho, August. The U. S. National Museum contains specimens from Douglass, Wyoming; Yellowstone, Montana and Colorado. Colorado, Saussure.

TRIMEROTROPIS COQUILLETTI, new species.

Size medium. Color dark brown, nearly plain, since the punctations are so small and dense as to serve merely to darken the general color without being themselves conspicuous.

Scutellum of the vertex with a distinct median carina; median foveolæ deeply and lateral foveolæ very lightly impressed. Pronotum with the prozone elevated somewhat and the median carina cristate and slightly bilobate; lateral carinæ obsolete on the metazone, visible on the front margin of the prozone; metazone a little less than twice as long as the prozone and rugulose with a few scattered larger granulations; margins of the obtuse-angulate process straight, the tip rounded. Tegmina very long, with the entire middle field unspotted except narrowly along the margins and hyaline on the outer half, yellow on the inner; anterior field infuscated by the presence of numerous maculæ on the basal third beyond with a single not very regular series of fuscous spots of varying sizes extending along and on either side of the principal veins; posterior field thickly maculate with fuscous points at the base beyond infuscated and impunctate; last branch of the radial sector distant from the fork almost half the length of the sector; intercalary vein separated distally from the median by its own width; area of the cubital forks hyaline at the base for half its length without cross veins, beyond with a few cross veins. Wings very long, distinctly more than twice as long as wide, with the apex greatly attenuated, so that the posterior margin is subparallel with the anterior. Disk light yellow, with a narrow distinct fuscous band extending along the posterior margin nearly to the anal angle, with a spur reaching half way toward the base; apex hyaline. Posterior femora with the disk of the inner face black with two white bands, lower sulcus black with one; outer face with one pale preapical preceded by a fuscous band.

Posterior tibiæ obscure yellow. Length of body (female), 26 mm.; length of tegmina, 30 mm.; length of posterior femora, 14 mm.

Type.—Cat. No. 5371, U.S.N.M.; one female, San Bernardino County, California. Coquillett collection.

The species is named in honor of the distinguished entomologist Dr. D. W. Coquillett.

CINCTA group.

In the pattern of the wings and in the flatness of the disk of the pronotum transitional to *Conozoa*.

Frontal costa sulcate for a short distance above the ocellus; scutellum of the vertex moderately sulcate, about as wide as long (female), or considerably longer (male) because of the inclusion of the median foveolæ; eyes about equal (male) or a very little less (female) than the genal groove; antennæ slightly exceeding (male) the posterior femora. Pronotum with the disk flat and the shoulders well marked even on the prozone, and lateral carinæ present on the anterior of the metazone and in front of the first sulcus, broken or entirely wanting between, and on the posterior part of the prozone; median carina moderately elevated and bilobate on the prozone with the anterior lobe much greater than the posterior; process of the metazone obtuse angulate with the sides straight and the tip sharp; lateral lobes with the posterior angle rounded. Tegmina with the median and basal dark bands solid and well defined, extending across the anterior and middle fields, the former sometimes faintly visible on the posterior field also; the light bands just beyond the dark ones about equal to each other and to the dark bands; apical third with fuscous annuli in somewhat regular series along either margin with a few scattered ones on the area between which has the principal and the adjoining veinlets darkened; extreme base punctate with fuscous; posterior field impunctate or most obscurely punctate; area of the cubital forks broad and filled with several series of polygonal cells in the female, in the male narrower, but the cells are in about two series; median and cubital forks not fused, free or united by a cross vein; intercalary vein separated from the median toward its tip by a distance several times (female) or at least once (male) its own width. Wings narrow, with the disk pale-greenish yellow, with the fuscous band narrow and ill-defined on the outside, shading off into fuliginous but disappearing for the most part in the subapical area, the tip again becoming infuscated or remaining clear, continued on the exterior margin less than half way to the anal angle. Spur long, extending more than half way to the base. Posterior femora with the disk of the inner side black with two light bands on the apical half; lower sulcus pale or more or less suffused with fuscous, with one black band before the pale preapical band.

TRIMEROTROPIS CINCTA Thomas.

Œdipoda cincta THOMAS, Proc. Acad. Nat. Sci. Phila., 1870, p. 80; Geol. Surv. Wyo., 1870, p. 275.

Probably none of the other references to *Œdipoda*, *Mestobregma*, or *Trimerotropis cincta* belong here. Thomas probably confused three, if not four, species under this name, one *Mestobregma* and three *Trimerotropis*. See *Trimerotropis vinculata* and *saxatilis*. Size medium, color dark and nearly plain except for two distinct, narrow, black bands which extend across the face, one just above and the other just below the insertion of the antennæ. These bands unite at the eye and extend as a narrow stripe from the posterior margin of the eye, across the head, and along the upper margin of the lateral lobes of the pronotum; on the head, behind the eye, it is accompanied by a narrow, yellowish stripe just above it. Scutellum with the median carina slight but rather distinct. Pronotum with the disk of the metazone roughened with rather numerous, short, linear granulations. Posterior tibiæ very variable, either obscure or red with a brownish basal cloud or livid with a distinct, subbasal, pale annulus, or brown without cloud or annulus.

One female (type) (*Œdipoda cincta*) Thomas, southeast Colorado, Texas, and New Mexico, 1869, U. S. National Museum; one female, Colorado; one male, 1 female, Pine Ridge, Nebraska, July (types of *Conozoa silvicola* Bruner), Bruner collection.

This species is unique, so far as my experience goes, in having such variable coloring of the tibiæ and in the black facial bands. The male from Pine Ridge has red tibiæ; the female from the same locality, plain brown ones; the female from Colorado, livid ones with a complete ring and the tips with the color obscure, and a brown cloud on the outside.

TRIMEROTROPIS JULIANA Scudder.

Trimerotropis juliana SCUDDER, App. JJ. Ann. Rept. Chief of Eng., 1876, p. 514.
Trimerotropis fontana THOMAS, Proc. Dav. Acad. Nat. Sci., I, 1876, p. 271.—BRUNER, Third Rept. U. S. Ent. Com., 1885, p. 57; Rept. U. S. Com. Agr., 1885, p. 307.—SAUSSURE, Add. Prodr. Œdip., 1888, p. 171.

This species is remarkably similar to *Trimerotropis cincta* Thomas, from which it is apparently different in the entire absence of the black bands of the face and in the broader vertex which in that species is scarcely, in this much more than half the short diameter of the eye.

One female (determined by Scudder), American Fork Canyon, 7,500 feet, August 5; one female, Salt Lake Valley, Utah, 1878, Bruner collection; one female, Spring Lake, Utah (probably one of the three type specimens of *Trimerotropis fontana*, U. S. National Museum. Common in Yellowstone Valley, Montana, Bruner.

CAERULEIPES group.

Species of small or medium size with the ground color generally dark, and when light not much varied with fuscous on the head and pronotum, but with the basal bands of the tegmina present and either semisolid and more or less conspicuous, or if obviously composed of smaller maculations then distinct by reason of their contrasting colors and the thorough segregation of the spots.

Scutellum moderately wide but not exceeding the short diameter of the eye even in the male and never wider than long; median carina never entirely absent but frequently indistinct. Pronotum with the prozone only slightly elevated and the median carina barely bilobate, on the metazone linear; metazone from one and a half to scarcely twice as long as the prozone; lateral lobes without a tooth. Tegmina with the area of the cubital forks occupied by several rows of polygonal cells; intercalary vein apically not more distant from the median vein than by its own width. Wings with the disk green or greenish yellow, the fuscous band narrow and interrupted, or if broader weak or interrupted along the radiate veins or wanting, in this case the apical half is wholly fuliginous and fuscous. When present continued never more than halfway to the anal angle. Spur when present elongate, extending more than halfway to the base. Posterior femora with the inner face black with two lighter bands on the apical half. Posterior tibiæ blue with the extreme base black preceded by a pale annulus.

TRIMEROTROPIS CAERULEIPES Scudder.

Trimerotropis caeruleipes SCUDDER, 2d Rept. U. S. Ent. Com. App. II, p. 27, 1880.

Size small or medium; dark brownish cinereous, much, though not conspicuously, varied with fuscous maculations; scutellum considerably longer than broad (male), with the median carina exceedingly faint; lateral and median foveolæ deeply impressed; eye of the male slightly longer than the genal groove. Pronotum with the metazone about twice as long as the prozone; shoulders well defined with a trace of the lateral carinæ on the front as well as at the front margin of the prozone; disk of the metazone with a few scattered larger granulations; process of the metazone rectangular or slightly obtuseangular with the sides straight and the apex barely rounded. Tegmina with the bands composed of fuscous spots and annuli arranged into a distinct basal and median band, on the apical third, scarcely forming a band, but extending along either margin; radial sector with the last branch distant from the fork about one-half (male) the length of the sector; median and cubital forks not fused. Wings long and narrow with the disk pale green, the fuscous band narrow, interrupted and scarcely continued toward the anal angle; spur distinct, extends more than halfway to the base; apex pale with the extreme tip more or less infuscated. Posterior femora with the lower sulcus black, except for a single preapical light band; outer face with the indistinct preapical pale band preceded by two and followed by one not very conspicuous fuscous bands.

Length of body, male, 18 to 21 mm.; female, 25 mm.; length of tegmina, male, 19 to 22 mm., female, 26 mm; length of posterior femora, male, 10 to 11½ mm., female, 12 mm.

One male, without locality; one male, Marble Valley, Eldorado County, California, Bruner collection; one male and two females, Portland, Oregon; Sissons, California, Scudder.

TRIMEROTROPIS TESSELATA, new species.

Trimerotropis coeruleipes TOWNSEND, Ins. Life, VI, 1893, p. 31.

Similar to *Trimerotropis caeruleipes* in the structure of the head and pronotum and very closely related to it. The following points of difference may serve to distinguish it.

Size medium, with unusually slender tegmina and wings; color, ash with a slight suffusion of brown on the top of the head and pronotum, and base of the tegmina much and strongly varied with fuscous.

Head as in that species, except that the vertex is more prominent, forming a right angle (seen from the side) with the front, the tip of the angle slightly rounded instead of a decidedly obtuse angular. Pronotum with the process of the metazone very strongly obtuse angulate, with the margins straight and the tip sharp. Tegmina very long and slender and decidedly falcate at the tip, cinereous, with very conspicuous fuscous bands at the end of the first, second, and third quarters, each of these solid and well defined on the anterior and middle field, punctate on the posterior field; beyond the third fuscous band is a series of large, distinct, triangular spots on either margin, with a very few equally distinct and well-defined spots in the middle area; light bands unspotted, except the basal one, which has a few fuscous punctations; radial sector with its last branch not more distant from the fork than a third (male) of the length of the sector. Wings long and narrow, the length slightly exceeding twice the width; apex slightly attenuated; disk nearly opaque light green with a yellowish tinge, with the outer half entirely infuscated, less deeply preapically; the fuscous border is continued along the posterior margin a little less than half way to the anal angle, spur extending distinctly more than half way to the base. Posterior femora with a faint preapical light band, but the fuscous bands inconspicuous. Hind tibiæ pale blue, with the subbasal pale annulus inconspicuous.

Length of body, male, 21½ mm.; length of tegmina, 24½ mm.; length of posterior femora, 12 mm.

One male, Turkey Tanks, Arizona, July 17, Bruner collection. This is the species probably which is mentioned by Townsend[1] under the name of *coeruleipes*.

TRIMEROTROPIS CALIGNOSA, new species.

This species is very closely related to the two preceding species, but is strikingly different in color.

Size, medium; color, very dark fuscous, almost black, except for the well-defined and distinct light bands on the tegmina, and the lighter ground color of the posterior femora.

Head as in the two preceding species, with the vertex not quite so prominent as in the last, and the median carina more distinct, especially in the posterior part of the scutellum and on the occiput; antennæ distinctly attenuate at the tip. Pronotum with the disk of the metazone supplied with rather numerous linear granulations; process of the metazone decidedly obtuse angulate, with the margins straight and the tip sharp. Tegmina long and slender, entirely infuscated, or at least fuliginous, except the usual light bands beyond the first and second quarters, which are well defined and distinct, but scarcely light enough to be conspicuous, the outer much narrower. By transmitted light the usual punctations at the extreme base and on the apical third can be seen; last branch of the radial sector distant from the fork a third or less (male), or a quarter (female). Wings with the disk transparent, tinged with olivaceous green, the outer half transparent but faintly fuliginous, with the extreme tip and, in some specimens, clouds in the region of the fuscous band slightly infuscated. Posterior femora with a light preapical band, followed by one and preceded by two rather distinct fuscous bands. Posterior tibiæ steel blue, with a very distinct whitish subbasal annulus.

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[1] Insect Life, VI, p. 31.

Length of body, male, 22 mm., female, 28 mm.; length of tegmina, male, 23½ mm., female, 29 mm.; length of posterior femora, male, 12 mm., female, 14 mm.

Types.—Cat. No. 5372,U.S.N.M.; two males, Los Angeles County, California; one female, California.

This form may be but a variety of the last, but its strikingly different coloration and the unusual wings forbid my placing it there.

TRIMEROTROPIS ALBESCENS, new species.

Size small, color white, sparsely punctate with black on the pronotum and conspicuously banded with black on the tegmina and posterior femora.

Scutellum moderately sulcate, considerably longer than broad, with a very indistinct median carina; median and lateral foveolæ well impressed; eyes more than equal (male) to the genal groove. Pronotum with traces of the lateral carinæ on the front part of the prozone and metazone, the latter one and a half times as long as the former; disk of the metazone with a very few larger granulation; process rectangular, with the sides straight and the tip sharp. Tegmina, like the body, white, with the basal band narrow and nearly solid, the median and third bands narrow and obviously made up of maculations, but very conspicuous; beyond the third fuscous band a few groups of fuscous annuli; all the white bands very broad and impunctate, except the basal, with a few dusky points, and an oblique black dash just beyond the edge of the pronotum when the tegmina are closed; last branch of the radial sector distant from the fork more than one third (male) the length of the sector; median and cubital forks not fused, but free. Wings with the disk light yellow, nearly transparent, bordered by a few fuscous clouds representing the fuscous band, apex hyaline. Posterior femora with the lower sulcus white except for a narrow stripe on the basal half and a band preceding the preapical light spot; exterior face white, except for a very distinct fuscous band preceding the preapical light band and a few faint clouds representing the other bands. Posterior tibiæ blue with the base black, followed by a distinct white annulus.

Length of the body, male, 18 mm.; length of the tegmina, 19 mm.; length of the posterior femora, 9 mm.

Type.—Cat. No. 5373, U.S.N.M.; one male, Los Angeles, Coquillett, collector.

TRIMEROTROPIS BIFASCIATA Bruner.

Trimerotropis bifasciata Bruner, Proc. U. S. Nat. Mus., XII, 1890, p. 70.

Size, small or medium; color, plain brown with a reddish tinge, with conspicuous dark solid bands on the tegmina. Scutellum but little longer than broad, moderately sulcate, with distinct, though slight, median carina; median and lateral foveolæ deeply impressed. Pronotum with no trace of lateral carinæ at the anterior margin of the prozone; metazone about once and a half as long as the prozone, the disk with a few indistinctly larger granulations; process of the metazone very strongly obtusangulate, with the margins slightly arcuate and the tip sharp. Tegmina with two solid conspicuous bands at the end of the first and second quarters, subequal in width and much narrower than the preceding lighter areas, but about equal to the light band following the second fuscous band, apical third with indistinct annuli arranged in about four groups on either margin, with a few intermediate ones; last branch of the radial sector distant from the fork about one-fourth (male) the length of the sector; median and cubital forks not fused, but free or united by a short cross vein. Wings moderately long, plainly less than twice as long as wide, with the apex very slightly attenuate; disk semitransparent, faint greenish, with a narrow somewhat interrupted fuscous band, scarcely extending upon the posterior margin, spur reaching more than halfway to the base, apex hyaline without fuscous spots. Posterior femora with the lower sulcus black, with two light bands on the apical half; exterior face with a light preapical band preceded by one fuscous band. Posterior tibiæ blue, with a rather wide, pale subbasal annulus.

Length of body, male, 21½ to 25 mm., female, 26½ mm.; length of tegmina, male, 20 to 25 mm., female, 25 mm.; length of posterior femora, male, 10½ to 13½ mm.; female, 13 mm.

One male, type, without locality, Bruner collection; one male, Tehama County, California, U. S. National Museum; one male, one female, Spokane, Washington, Los Angeles, Coquillett; collector, Bruner.

TRIMEROTROPIS FERRUGINEA, new species.

Size, small or medium; color, cinereous, varying to reddish-brown, rather indistinctly punctate and blotched on the head and pronotum, with the tegminal bands well defined, nearly solid and conspicuous; scutellum deeply sulcate, once and a half (female) or twice (male) as long as broad, with the median carina slight, but moderately distinct; median and lateral faveolæ moderately well impressed; eyes equal to (male) or a little shorter (female) than the genal groove. Pronotum with the lateral carinæ indistinctly present on the front of the prozone and less frequently on the front of the metazone, disk of the latter with rather numerous larger granulations; process of the metazone obtusangulate, with the margins straight and the tip sharp. Tegmina rather short and somewhat tapering, with the median and basal bands solid on the anterior and middle fields, more or less broken and interrupted on the posterior field; first and second light bands about twice as wide as the third and as the included fuscous band, the basal light band only, punctate with fuscous; apical third with the usual fuscous annuli and punctations rather numerous, but only moderately distinct and irregularly grouped; last branch of the radial sector distant from the fork a little more than one-fourth of the length of the sector; median and cubital forks not fused, free or united by a cross vein.

Wings moderately wide, but attenuate at the tip; disk faint greenish-yellow, with a narrow or rather broad but interrupted fuscous band continuing halfway or less toward the anal angle, with the spur extending distinctly more than halfway to the base. Posterior femora with the lower sulcus light below, with one dark band, more or less infuscated on the basal half, leaving two bands; outer face with a light preapical band preceded and followed by a moderately distinct fuscous band. Posterior tibiæ blue-black at the base, with a pale subbasal annulus.

Length of body, male, 17 to 21 mm., female, 28 mm.; length of tegmina, male, 20 to 23 mm., female, 28 mm.; length of posterior femora, male, 9 to 11 mm., female, 14 mm.

One male and one female, Soda Springs, Idaho; one female, Cœur d'Alene, Idaho, Wickham, collector; one male and one female, Heckla, Wyoming; one female, Madison River, National Park, Wyoming; one male (9500) American Fork Canyon, Utah, August 2 and 3, 1877, Bruner collection.

TRIMEROTROPIS KOEBELEI Bruner.

Conozoa koebelei BRUNER, Proc. U. S. Nat. Mus., XII, 1890, p. 67.

This species is closely related to *Trimerotropis bifasciata*, and still more closely to *Trimerotropis ferruginea*. If the latter should prove to be only a variety of the former this would then undoubtedly be, though at first glance they seem to have little in common, as far as color is concerned. It appears to differ from *ferruginea* as follows: Size smaller, color distinctly cinereous, with no suggestion of reddish-brown; tegmina with the posterior field cinereous or whitish, entirely impunctate, the usual bands therefore limited to the anterior half, or at least to the anterior and middle fields; scutellum as in that species, but median carina wanting or extremely faint.

Length of body, male, 17 mm., female, 25 mm.; length of tegmina, male, 18 mm., female, 25 mm.; length of posterior femora, male, 10 mm., female, 14 mm.

One male (type), Placer County, California, September, Bruner's collection; one male and one female, Placer County, California, September, and San Francisco, California, U. S. National Museum.

If I had not very much restricted *Conozoa* I should still be compelled to remove this species from that genus, as it has none of the characters of that genus except the coloration of the tegmina, and that is quite as suggestive of the pattern peculiar to *Trimerotropis.*

TRIMEROTROPIS THALASSICA Bruner.

Trimerotropis thalassica BRUNER, Proc. U. S. Nat. Mus., XII, 1890, p. 72.

I am unacquainted with this species and unable to place it with certainty, but it apparently belongs to the group *Cœruleipes.* I give Bruner's description somewhat abbreviated where the characters given are common to the group:

> About the size of *Trimerotropis vinculata* Scudder, varying in color from dark to griseo-testaceous, with the colored portion of the wings sea-green; wings and tegmina but dimly banded; posterior tibiæ deep cœrulean, with basal annulus of dirty whitish.
>
> Head, when seen from in front, as broad above as below, a little longer than common with the species of the genus; the eyes rather large and prominent, separated above by the flat (female) or slightly sulcate (male) vertex; pronotum somewhat smoother than usual, the anterior lobe but gently raised above; the median carina faint and rather equal; posterior angle slightly acute (male), about a right angle (female).

CITRINA group.

Color various shades of brown, usually inclining to red, with plain traces of the usual tegminal bands present, well defined if faint or with strongly contrasting colors if the spots are imperfectly segregated. Scutellum of the vertex at most moderately sulcate, broad, very rarely a little longer than broad, usually as broad as long, plainly less than the short (male) or long (female) diameter of the eye. Pronotum with the median carina low, even on the prozone, and not always bilobed (when seen from the side); lateral carinæ absent, except a trace on the anterior of the prozone; metazone very rarely as little as once and a half, usually twice, as long as the prozone; lateral lobes without a tooth at the lower posterior angle; tegmina with the intercalary vein separated from the median by scarcely (male) or considerably (female) more than its width; area of the cubital forks broad and occupied by more than one row of polygonal cells. Wings with the disk yellow or greenish yellow, and the fuscous band distinct but never in width equaling one-third the length of the wing. Posterior femora having the basal half of the disk of the inner face never entirely black (rarely the whole inner face may be suffused with fuliginous, so that the usually lighter areas are almost as dark as the black ones), but with a light area of greater or less extent at the base, so that the usual appearance is light, with three black bands, one on the knee, one at the middle, and one between; the basal one, as it increases in size, assumes the appearance of a stripe, which, however, never reaches the base. Frequently the light area is suffused with red. Posterior tibiæ red, rarely with a distinct subbasal annulus, but always with some trace of a yellow or brownish cloud on the exterior face.

TRIMEROTROPIS MONTICOLA Saussure.

Trimerotropis monticola SAUSSURE, Prodr. Œdip., 1884, p. 170; Add. Prodr. Œdip, p. 63, 1888.

Color reddish or grayish brown, thickly and rather conspicuously maculate, with fuscous cheeks and front of the head generally livid and less maculate. Size medium. Scutellum moderately sulcate, a very little longer (male) or shorter (female) than broad, with the median carina very indistinct or wanting; median and lateral faveolæ only moderately impressed; eyes small, distinctly (male), or considerably (female) shorter than the genal groove. Pronotum with the median carina slightly cristate on the prozone and bilobed; metazone rather more than once and a half as long as wide, with the disk smooth, and a few scattered larger granulations; process of the metazone strongly obtuse-angular, with the sides straight and scarcely rounded. Tegmina short and broad, with the basal bands not solid, but showing some evidence of being composed of fuscous points; maculations on the apical third about as thick and scarcely less distinct in the middle than along the margins of this area; extreme base never entirely free from fuscous points. Wings broad, about one and three-fourths times as long as broad, with the tip very little attenuate and sinuate behind the second lobe; disk greenish or citron yellow, with a moderately broad and very distinct fuscous band, varying in width from a sixth to a fourth the length of the wing, continued upon the posterior border plainly less or decidedly more than halfway to the anal angle, spur extending a little more or less than halfway to the base; apex hyaline, with rarely a few fuscous points. Posterior femora rather distinctly banded on the outside; inner face yellow, more or less suffused with red, with three black bands, the basal largest; lower sulcus yellow or red, with one indistinct subapical black band. Posterior tibiæ bright red or yellow flushed with red, with an inconspicuous basal yellow cloud, confined to the outer side.

Length of body, male 21 to 25 mm., female 25 to 27 mm.; length of tegmina, male 24 to 25 mm., female 27½ to 30 mm.; length of posterior femora, male 11 to 12½ mm., female 13 to 14 mm.

TRIMEROTROPIS CAMPESTRIS Bruner, Manuscript.

This species is probably nothing more than a variety of *Trimerotropis pallidipennis*, from which it apparently does not differ except in the structure and color of the posterior tibiæ; the marked infuscation of the top of the head and the prozone being repeated with almost, if not quite, as much distinctness as in that species. The posterior femora are unusually slender, with the black bands of the inner face small, but all the markings obscured by a fuliginous suffusion which extends upon the lower sulcus. I have two females from the Bruner collection, both marked "type," which differ considerably in size, markings of the tegmina, and the width of the fuscous band, but they agree in structural points and especially in the hind femora. The smaller one has the fuscous points very imperfectly gathered into bands.

Length of body, female, 24 to 28 mm.; length of tegmina, 25 to 27 mm.; length of posterior femora, 11 to 14 mm.

One male and one female, Pine Bluffs, Wyoming; Bruner collection.

TRIMEROTROPIS BRUNERI, new species.

Hadrotettix gracilis BRUNER manuscript.

Reddish brown, not strongly punctate with fuscous but very conspicuously banded on the tegmina and posterior femora; head, and less commonly the lateral lobes of the pronotum in front of the principal sulcus, pallid; pronotum with a longitudinal whitish stripe on the upper part of the lateral lobes, extending from the middle sulcus to the front margin; below this, near the middle of the lobes, a second but smaller quadrate spot of a similar color. Scutellum of the vertex somewhat (male) or not (female) longer than wide (if the very slightly impressed median faveolæ are included as a part of the scutellum, the proportion of length to breadth will be considerably increased); median carina present and more or less distinct; eyes decidedly shorter than the genal grooves even in the male. Pronotum with the median carina very low, not bilobate on the prozone; anterior margin decidedly angulate; metazone about twice as long as the prozone, its disk evenly and very finely granulate; process of the metazone decidedly acute-angled, with the margins straight and the tip a little rounded. Tegmina, more especially in the male, narrowed considerably and regularly from the basal band to the apex; basal and median bands very distinct and solid, with the base rouged without fuscous punctations and the apex with the usual scattered punctations, usually rather faint and more distinct on either margin than in the middle. Wings broad, 1¾ times as long as broad, with the apex not attenuate; fuscous band moderately broad, at least a sixth as wide as the length of the wing and very distinct, continued along the posterior margin more than halfway to the anal angle; spur short, extending toward the base about one-third of the distance. Posterior femora unusually heavy, with the inside yellow, more or less suffused with red, and crossed by three black bands, the basal sometimes much reduced; outer side crossed transversely by one distinct subapical band, a continuation of the one on the inner surface; lower sulcus red, crossed by the same subapical band. Posterior tibiæ bright red, with an indefinite subbasal yellow cloud on the outer face only.

Length of body, male 21 to 26 mm., female 23 mm.; length of tegmina, male 21½ to 25 mm., female 22 mm.; length of posterior femora, male 11 to 13 mm., female, 13 mm. Two males, Hot Springs, South Dakota; one male and one female, Cheyenne, Wyoming, Bruner collection; one male and one female, Chadron, Nebraska; one male and one female, Hot Springs, South Dakota, Stanford University collection.

While this species resembles *Hadrotettix trifasciata* so strongly in coloration as to readily be mistaken for it, in generic characters it is allied in every particular to *Trimerotropis*, where the latter genus differs from the former. The distinct sulcation of the scutellum of the vertex, with a plain median carina, the slender though long antennæ, the presence of distinct shoulders on the prozone of the pronotum, the relatively long tegmina, which does not have a third band as well defined as the second, but the usual group of annular spots, the comparatively little thickened tegmina, which are not densely coriaceous beyond the outside of the basal band and which have quadrate cells much within the basal branch of the radial sector, in the character of the fuscous band which is quite trimerotropine and extremely different from that of *Hadrotettix*, which lies entirely beyond the middle, so that the disk is longer than wide, and has a long continuation upon the posterior margin which is greater in length than the transverse portion of the band. And finally in the coloration of the inside of the posterior femora, which seems to me to be one of the most trustworthy guides to relationship because it is not subject to natural selection. These in *Hadrotettix* are deep indigo blue, extending entirely over the inner face (including the upper sulcus, which is not true of a single *Trimerotropis*), interrupted by one broad, whitish band. If this species and one other, which is more like *Hadrotettix*, not to mention other species which are structurally, though not in coloration, nearer to it, are retained in that genus there would not remain a single salient character to distinguish the genus. For these reasons I have felt it necessary to transfer Bruner's *Hadrotettix* to *Trimerotropis*, and as gracilis is preoccupied I have given it the name of the distinguished author.

TRIMEROTROPIS FASCICULA, new species.

In color or size very similar to *Trimerotropis bruneri*, from which it is distinguished by the following characters:

Scutellum of the vertex moderately sulcate as in that species with lateral carinæ quite as distinct but longer and narrower and without a trace of the median carina. Pronotum as in that species with the metazone having the disk furnished with minute linear granulations. Tegmina with the two basal bands not so regular and well defined. Wings with the fuscous band narrower, the spur reaching halfway to the base and the continuation on the posterior border not extending more than half way to the anal angle. Posterior femora as in that species, but without any red suffusion and with the basal stripe elongate nearly to the base, sometimes the whole inner face is suffused with fuliginous, more or less obscuring the usual markings. A variety has the pronotum scarcely longer than broad with the process of the metazone decidedly obtuse angulate. The wing band is a little broader.

Length of body, male 18 mm., female 26 mm.; length of tegmina, male 19 mm., female, 26 mm.; length of posterior femora, male 10½ mm., female 14 mm.

One male and one female, Arizona or New Mexico; one female, Silver City, New Mexico; Bruner collection.

This species is very closely related to *Trimerotropis bruneri* and may not be specifically different from it.

TRIMEROTROPIS PRÆCLARA, new species.

Similar in size and structure to *Trimerotropis citrina*, but with the tegmina very distinctly marked, the basal and median bands solid and well defined.

The scutellum is slightly broader than in that species, with the median carina slight but distinct. The pronotum has the median carina not cristate on the prozone and scarely bilobate when viewed from the side. The tegmina have the fuscous annuli of the apical third for the most part aggregated into a single group, which forms the third band, the basal area within the basal band is suffused with purple or brown with a few darker punctations. The posterior femora have the basal band elongate and extending nearly to the base, the light area being more or less suffused with red, the lower surface is reddish, somewhat obscured with a fuliginous suffusion and crossed by a single subapical band, the outer face has a single transverse, rather distinct, subapical band. The posterior tibiæ are bright red, with a faint yellowish cloud on the outside near the base.

Length of body, male 24 mm., female 26 mm.; length of tegmina, male 30 mm., female 28 mm.; length of posterior femora, male 13 mm., female 14 mm.

One male and one female, Salt Lake, Utah; Sidney, Nebraska; Bruner collection.

TRIMEROTROPIS MODESTA Bruner.

Trimerotropis modesta BRUNER, Proc. U. S. Nat. Mus., XII, 1890, p. 72.

Closely related to *Trimerotropis citrina*, but easily separated from that species by the following characters: Color, yellowish brown, nearly plain, on account of the extreme faintness of the darker maculations. Scutellum quite as deeply sulcate as in that species, and with no more trace of median carinæ. Pronotum with the metazone nearly twice as long as the prozone, with the process acute-angled, the sides slightly sinuate, and the tip rounded. Tegmina yellowish brown and plain, except for the narrow and very inconspicuous basal and median bands, and the faintest traces of the apical band in a few faintly fuscous annuli near the anterior margin. Wings as in that species with the band slightly narrower and its posterior extension much shorter, reaching less than halfway to the anal angle. Posterior femora with the basal stripe rather long, the lower sulcus yellow, crossed by the subapical band and the outer face crossed by the same bands more or less distinct. Posterior tibiæ red, with an indistinct yellow cloud at the base on the outer side.

Length of body, female, 26½ mm.; length of tegmina, 27 mm.; length of posterior femora, 14 mm.

One female, Silver City, New Mexico, Bruner's type.

The species is based upon two females from the locality given above, and it has not been reported elsewhere.

TRIMEROTROPIS CITRINA Scudder.

Trimerotropis citrina SCUDDER, U. S. Geol. Surv. Terr., II, 1876, p. 265.—SAUSSURE, Prodr. Oedip., 1884, p. 169.

Size medium or large, with the bands of the tegmina obviously mere aggregations of fuscous rings, which are, however, well separated into the usual bands; otherwise the body, head, and limbs are very thickly covered with fuscous punctations which cause the insects to very closely resemble the sand surfaces which they frequent.

Scutellum very little longer than broad, moderately sulcate, with scarcely a trace of the median carina; median foveolae a little more plainly impressed than the lateral generally, but neither are very distinct; eyes as long (male) or a very little (female) shorter than the genal groove. Pronotum with the median carina barely cristate even on the prozone and just perceptibly bilobate; anterior margin not distinctly angulate; metazone but little more than once and a half as long as the prozone, its disk rather coarsely and nearly evenly granulate; process of the metazone decidedly obtuse angular, with the margins straight and the tip rounded. Tegmina longer and showing little contrast in color. Wings moderately long, being one and three-quarter times as long as broad; disk greenish yellow or pale citron with the fuscous band broad, the width being from one-fifth to one-fourth the length of the wing, continued upon the posterior margin much more than half way to the anal angle, spur short, extending less than halfway to the base; apex hyaline without any fuscous cells. Posterior femora with the inside yellow, crossed by three fuscous bands and sometimes a fourth fuscous cloud near the base, lower sulcus yellow, with the subapical fuscous band distinct, the median ones usually less distinct but always present, outer face with mere traces of the usual bands. Posterior tibiæ red, with an indefinite cloud of lighter color near the base extending across the lower as well as the outer face. Length of body, male, 20 to 23 mm., female, 30 to 32 mm.; length of tegmina, male, 27 to 28 mm., female, 32½ to 35 mm.; length of posterior femora, male, 11 to 12 mm., female, 15½ to 16 mm.

One male, Maryland, Pergande collector, U. S. National Museum; one male and one female, Carrizo Springs, Texas, A. Wadgymar collector, Bruner collection; numerous specimens from northwest Arkansas in my own collection; Denver, Colorado, July 10, Red River of the North, Kennicott collector; Dallas County, Texas, June 6, Ball collector, and Texas, Belfrage collector, June, July, October, and November, Scudder; Texas and Colorado, Saussure; Nebraska, Brunner. This species, in its dull isabelline color, resembles *Trimerotropis maritima*, and is easily mistaken for it where the two occur together. That it should be found as far east as Maryland is somewhat unexpected, but since it is common in northwest Arkansas there is no reason why it should not be found in the mountainous districts of Kentucky, Tennessee, the Virginias, and Maryland.

LATIFASCIATA group.

Color dull brown with slightly contrasting maculations. Size medium or large. Frontal costa more or less sulcate with the carinæ vanishing before reaching the clypeus; scutellum of the vertex about as wide as long, very moderately or scarcely sulcate, equaling in width the short (male) or long (female) diameter of the eye, which is slightly (male) or much (female) shorter than the genal groove. Pronotum with the median carina low even on the prozone and not bilobate when seen from the side; metazone nearly or quite twice as long as the prozone; lateral lobes without a tooth. Tegmina with the bands well defined but rather faint and rarely obviously made up of annuli or punctations; area of the cubital forks broad with several series of polygonal cells; intercalary vein separated from the median by little (male) or considerably (female) more than its width. Wings ample with the fuscous band broad or very broad, at least more than a fifth the length of the wing. Posterior femora mostly black on the disk of the inner face, with one or two light bands. Posterior tibiæ red with a yellowish cloud at the base on the outer side.

TRIMEROTROPIS LATIFASCIATA Scudder.

Trimerotropis latifasciata Scudder, App. II, 2d Rept. U. S. Ent. Com., 1880, p. 26.

Yellowish brown, plain except for the moderately distinct tegminal bands; size large, robust.

Frontal costa sulcate above the ocellus for a very short distance, above rounded; scutellum of the vertex broader than long (female) scarcely sulcate without a trace of the median carina; median and lateral faveolæ lightly impressed. Pronotum with the median carina coarse and strong, barely cut by the first sulcus, so that, seen from the side, the crest recalls the genus *Arphia;* metazone less widened posteriorly than usual, with disk finely and evenly granulate, with the process obtuse angular, the sides straight, and the tip rounded. Tegmina with the median and basal bands directly transverse, very narrow, and well defined; the apical band composed of four narrow transverse groups of annuli, the two basal ones extending nearly across the tegmina. Wings moderately ample and rather broad, the length being nearly one and three-quarter times the width; apex very slightly attenuate; fuscous band broad, being a little less than one-fourth of the wing in width, continued along the posterior border to the anal angle, spur very short, reaching less than a third of the way to the base. Posterior femora yellow, more or less suffused with red on the inner face with three black bands, the median one not larger than the subapical and widely separated from the base; lower sulcus reddish yellow with one subapical black band, outer face with the subapical fuscous band rather distinct. Posterior tibiæ orange red with a yellow sub-basal cloud on the exterior.

Length of body, female, 34 mm.; length of tegmina, 32 mm.; length of posterior femora, 16½ mm.

One female, 4,300 feet, Salt Lake Valley, Utah, August 1–4, 1877; determined by S. H. Scudder. Two females, Wallula, Washington, September 1; Lake Point, Utah, August 14.

The species is apparently a rare one, as it seems to have been reported by no one else except Bruner, and his specimens, I think, belong to *Trimerotropis laticincta.*

TRIMEROTROPIS LATICINCTA Saussure.

Trimerotropis laticincta Saussure, Prodr. Œdip., 1884, p. 169.

Large and robust, with very ample wings; color reddish brown, with moderately distinct and broad tegminal bands.

Scutellum shallowly sulcate, with a slight but rather distinct median carina. Pronotum with the metazone finely granulate with a few widely scattered short linear granulations; process of the metazone obtuse angulate, with the lip much rounded; a trace of the lateral carinæ on the front part of the metazone and prozone. Tegmina ample with basal and median bands wide, especially on the posterior border, both showing some evidence of being made up of annuli, but well defined; bands of the apex faint and composed of annuli, which are segregated into about four subordinate groups, the basal being much the largest.

Wings very ample, the width two-thirds of the length with the apex attenuate somewhat; fuscous band very broad, being about one-third the length of the wing in width, continued upon the posterior margin nearly to the anal angle. Spur very short, extending less than one-fourth of the way to the base; apex hyaline, without fuscous spots. Posterior femora plain without, on the inner side black with two light bands on the apical half; lower sulcus red with one subapical fuscous band. Posterior tibiæ red.

Length of body, female, 33 mm.; length of tegmina, 34 mm.; length of posterior femora, 15 mm.

One female, New Mexico, Marsh collection, Bruner collection. Texas, Boll collector, Saussure. Nebraska, Bruner.

As Saussure says, it is similar to *Trimerotropis citrina*, but it is easily distinguished by its very ample wings, which appear to be wider than the ordinary type of wing in this genus by the whole width of the anterior lobe. The species from Nebraska, referred by Dr. Bruner to *Trimerotropis latifasciata*, probably belongs here, as the New Mexican female is certainly not *Trimerotropis latifasciata*.

TRIMEROTROPIS TOLTECA Saussure.

Œdipoda tolteca SAUSSURE, Rev. et Mag. Zool., XIII, 1861, p. 397.—THOMAS, Acrid. of N. Am., 1873, p. 215.

Trimerotropis tolteca SAUSSURE, Prodr. Œdip., 1884, p. 169.

I have not seen this species, but it appears to fall into this group and to be not very closely related to *Trimerotropis monticola*. Its distinctness seem sto be assured by the fact that the outer half of the wing is infuscated. For the sake of completeness I append a translation of of Saussure's description of the species:

Fuscous gray, rough. Head somewhat prominent, vertex rather broad between the eyes, with the scutellum subpolygonal, not longer than broad. Lateral foveolæ subelongate with the apex rounded. Facial costa broader on the front (female), narrower at the vertex and bifoveolate. Pronotum densely punctate and granulate, with the disk of the prozone (female) furnished with slightly elevated oblique carinæ in front of the anterior sulcus. Disk of the metazone rough with the lateral carinæ somewhat distinct, process acute angular with the margin punctate with black, median carina slight but nevertheless elevated anteriorly near the sulcus (on which account the crest of the pronotum, seen from the side, appears to be trilobate). Tegmina extending as far as one-third the length of the posterior tibiæ, shorter than in allied species, colored throughout and obsoletely banded. Wings with the apex more obtuse, the basal half sulphurous, the rest infuscated. Posterior femora with the basal half broad with the margins dilated and sinuate beyond the middle as well as strongly narrowed, inner face black with the margins and a preapical band yellow; on the outer side the carinæ are punctate with black. *Variety a*, wings with the apical half with hyaline clouds. *Variety b*, disk yellow with an obsolete fuscous band. Length of body, male 17 mm.; female 30 mm.; length of tegmina male 18 mm., female 26 mm.

Mexico, in temperate and higher regions; Orizaba, Oaxaca.

TRIMEROTROPIS PISTRINARIA Saussure.

Trimerotropis pistrinaria SAUSSURE, Prodr. Œdip., 1884, p. 173.

Plain brown with the tegminal bands quite well defined and moderately distinct. Size medium to large.

Scutellum slightly sulcate with the median carina slight but visible, median and lateral foveolæ well impressed. Pronotum with the median carina very slight; metazone more than twice as long as the prozone, with the disk furnished with a few scattered quite large granulations; process of the metazone acute angular with the sides straight and the tip sharp. Tegmina with the median and basal bands about the same size with boundaries well defined and moderately broad, equaling the light space between; annuli of the apical third scattered. Wings moderately broad, being a little less than one and two-thirds times as long as broad; fuscous band very broad, being a little more than one-third the length of the wing in width, scarcely continued at all upon the posterior border; spur rather long, extending nearly halfway to the base. Posterior femora and tibiæ as in *Trimerotropis melanopteras*.

Length of body, male 22 mm., female 32 mm.; length of tegmina, male 25 mm., female 31 mm.; length of posterior femora, male 13 mm., female 16½ mm.

One male and one female, Zacatecas, Mexico, November, 1897, Bruner collection; Texas, Boll collector; Saussure.

As Saussure remarks, this species approaches *Hadrotettix*, but it is a true *Trimerotropis* in most of its structural characters, and entirely so as far as coloration is concerned.

TRIMEROTROPIS MELANOPTERA, new species.

Color plain dull brown with moderately distinct tegminal bands. Size, large. Scutellum moderately sulcate with slight but rather distinct median carina, median and lateral foveolæ unusually well impressed. Pronotum with the median carina very low; metazone twice as long as the prozone, smooth with a very few widely scattered larger granulations; process of the metazone acute angular with the sides straight and the tip square. Tegmina with the basal and median bands rather ill-defined and more or less distinct, the latter broader, the apical third is punctate with scattered annuli scarcely grouped into a band. Wings of moderate size, rather long but distinctly less than twice as long as broad, fuscous band extremely broad so that it is two-thirds of the length of the wing in width, leaving but a narrow yellow strip on the inner margin four times as long as it is wide, and an equally narrow strip at the apex; spur none. Posterior femora with the disk of the inner face and the lower sulcus black with one subapical red band; outer side plain, except for a rather distinct light band. Posterior tibiæ coral red with a trace of the usual subbasal cloud present on the outer side.

Length of body, male 26 mm., female 37 mm.; length of tegmina, male 29 mm., female 35 mm.; length of posterior femora, male 14 mm., female 18 mm.

One male and one female, Silver City, New Mexico; Bruner collection.

I know of no form nearly related to this that has such an extensive black area. It compares in this respect with *Dissosteira carolina.*

CALIFORNICA group.

Small, light-colored species, with the bands of the tegmina distinct or wanting, not merely faint on account of slight contrast between them and the ground color. Scutellum of the vertex moderately or strongly sulcate, much longer than wide, not exceeding in the width of the short (male) or long (female) diameter of the eye. Pronotum with the median carina rarely more than slightly cristate even on the prozone, but always more or less distinctly bilobate when viewed from the side; lateral carinæ wanting even on the front part of the prozone, but the shoulders well marked on the metazone; the latter once and a half to twice as long as the prozone, with its disk smooth; lateral lobes with a tooth. Tegmina with the last branch of the radial sector from one-third to one-half the length of the sector from the forks; area of the cubital forks occupied by several series of polygonal veins; intercalary vein on the apical portion distant from the median not more than once its own width in either male or female; wings with the disk yellow and a moderately broad and distinct fuscous band; apex hyaline, very rarely with a slight suffusion of fuscous at the extreme tip. Posterior femora with two light bands on the apical half of the disk of the inner face, the basal half nearly entirely black or the area next the base light; outer face with one or more distinct dark bands; lower sulcus light with one or two dark bands. Posterior tibiæ red, with a pale cloud next the base, most distinct on the outer side.

TRIMEROTROPIS CALIFORNICA Bruner.

Trimerotropis californica BRUNER, Proc. U. S. Nat. Mus., XII, 1890, p. 71.

Scutellum of the vertex deeply sulcate, with a very faint median carina; median and lateral foveolæ rather strongly impressed; eyes about equal (male) or a little less (female) than the genal groove.

Pronotum with the prozone considerably elevated and bilobate when seen from the side, the anterior being much longer than the posterior lobe; metazone about one and three-quarter times as long as broad, with the disk finely granulate and the process a little less or somewhat more than a right angle; lateral lobes with a large tooth. Tegmina with the basal band distinct and usually solid, preceded by a rouged area punctate with fuscous and followed by an unspotted light band wider than itself; median band never quite as well defined as the basal, but larger and subtriangular, broader on the posterior margin, followed by a light band narrower than the first; distal third occupied by rather numerous annuli, which imperfectly arrange themselves into three or more narrow, transverse bands. Wings narrow, about twice as long as wide, with the apex slightly attenuate; fuscous band rather narrow, not exceeding in width one-sixth the length of the wing, narrowed distinctly behind the spur, which extends more than half way to the base, continued upon the posterior margin less than half way to the base. Posterior femora with the disk of the inner face not entirely blackened by a stripe which extends nearly to the base; apical half light, with two black bands, the proximal one extending across the lower sulcus and across the outer face; the former has a faint fuscous band proximal to the first and the latter is usually furnished with one or two distinct bands in addition to the one already mentioned and the apical one. Posterior tibiæ coral red, with the usual subbasal annulus.

Length of body, male 17 to 18 mm., female 24 mm.; length of tegmina, male 20 to 24 mm., female 24 mm.; length of posterior femora, male 8 to 12 mm., female 12 mm.

One male, Los Angeles, California, Coquillett, collector; U. S. National Museum. One male, Los Angeles, California, Coquillett, collector; Bruner collection. Two males, Ontario, California, Snodgrass, collector; Stanford University collection. One female, California, Wickham, collector; San Louis Valley, California; Bruner.

TRIMEROTROPIS STRENUA, new species.

Very closely related to *Trimerotropis californica*, from which it differs as follows:

Scutellum of the vertex broader; median carina distinct. Pronotum with the prozone very slightly elevated, tooth of the lateral lobes minute; process of the metazone decidedly acute angulate. Tegmina with the basal band very narrow, being three or four times as long as wide, distinct and well defined, median band and apical third as in that species, with the three light bands entirely unspotted and occupying twice as much space as the basal and median fuscous bands together. Wings with the fuscous band rather broad, occupying at least a fifth of the wing, continued on the posterior border rather more (male) or less (female) than half way to the anal angle. Spur short, extending not more than one-third of the way to the base. Posterior femora with the disk of the inner face black, with two yellow bands on the apical half; lower sulcus yellow, with one subapical black band; outer face plain, with a single black transverse subapical band.

Length of body, male 21 mm., female 29 mm.; length of tegmina, male 18 mm., female 28 mm.; length of posterior femora, male 11½ mm., female 12½ mm.

One male and one female, Salt Lake Valley, Utah, September; Bruner collection.

This and the following species may be but varieties of an exceedingly variable species. This doubt can only be cleared up by more specimens from intermediate points.

TRIMEROTROPIS MONTANA Bruner, manuscript.

This species differs from both the preceding species, to which it is closely allied, in the following particulars:

Scutellum with the median carina nearly as distinct as the lateral. Pronotum with the metazone scarcely more than one and a half times as long as wide; process of the metazone strongly obtuse angulate; tooth of the lateral lobes minute. Tegmina about as in *Trimerotropis californica.* Wing about as in that species, with the band equally narrow, but the spur much shorter, exending not more than a fourth of the way to the base. Posterior femora with the inner face very similar to *Trimerotropis californica* and the outer like those of *Trimerotropis strenua.*

Length of the body, male 19 mm.; length of the tegmina, 22 mm.; length of posterior femora, 9½ mm.

One male, Boise City, Idaho; Bruner collection.

TRIMEROTROPIS AGRESTIS, new species.

Pale reddish brown, with the face and sides of the head whitish plain, with a few scattered spots on the tegmina, not showing any trace of the usual arrangement into three bands.

Frontal costa plainly sculcate above as well as below the ocellus; scutellum strongly sulcate, with the merest trace of a median carina, broad, almost equaling the long diameter of the eye in the female; eyes plainly (male) or much (female) shorter than the genal groove. Pronotum with the median carina more than usually distinct on the metazone, slightly cristate and plainly bilobate on the prozone; median carinæ barely visible on the front part of both metazone and prozone; metazone nearly twice as long as the prozone, with the disk finely granulate and the process decidedly obtuse-angulate; lateral lobes with a large tooth, which causes the posterior lower angle to appear to be drawn downward. Tegmina entirely plain except for a few scattered spots, without a trace of the usual bands. Wings moderately broad, with a distinct and wide fuscous band, which is equal in width to about one-fifth the length of the wing, continued upon the posterior border much more than halfway to the anal angle. Spur very short, extending less than one-fourth of the way to the base. Posterior femora with the whole inner face reddish, but more or less suffused with fuliginous, so that the three black bands are not easily distinguished; outer face plain, with a narrow light subapical band. Posterior tibiæ red with the usual light subbasal cloud.

Length of body, male, 22 mm., female, 27 mm.; length of tegmina, male, 23 mm., female, 28 mm.; length of posterior femora, male, 11 mm., female, 13½ mm.

One male and one female, Sidney, Nebraska. Bruner collection.

This species is unique among the red-legged Trimerotropis for its plain tegmina.

PACIFICA group.

TRIMEROTROPIS PACIFICA Bruner.

Trimerotropis pacifica BRUNER, Proc. U. S. Nat. Mus., XII, 1890, p. 78.

Size medium, color light cinereous, with minute fuscous punctations scarcely visible to the naked eye and serving merely to darken the ground color, bands on the tegmina conspicuous.

Scutellum but little constricted above or below the ocellus, very moderately sulcate with the lateral carinæ vanishing long before reaching the clypeus; scutellum much longer than wide, barely sulcate, with the median carina nearly as distinct as the lateral; eyes scarcely as long as the genal groove even in the male; antennæ longer than usual in the genus, slightly flattened and distinctly attenuate at the tip. Pronotum with the anterior margin decidedly angulate; median carina not cristate even on the prozone, on the metazone, a raised line as distinct posteriorly as anteriorly; metazone with the disk smooth or very evenly granulate; the process acute-angular with the sides straight and the tip pointed; lateral carinae entirely wanting even on the anterior of the prozone; lateral lobes with a minute tooth on the lower posterior margin. Tegmina narrow, with the fuscous bands solid and contrasting strongly with the very light ground color; the usual annular spots wanting, almost entirely proximate to the basal band and restricted on the distal third to a series of groups along either margin, the first on the anterior margin being conspicuously larger; hyaline portion of the tegmina with quadrate cells, limited by a line extending obliquely across the tegmina about halfway between the median fork and the last branch of the radius; intercalary vein in its apical portion very close to the median, being separated from it by not more than its width; area of the cubital forks narrow, but filled with more than one series of polygonal cells. Wings narrow with the apex attenuated, twice as long as broad; disk dilute yellow, with the fuscous band interrupted below the spur, but otherwise distinct and moderately broad, being about one-fifth of the length of the wing, continued on the posterior margin much less than halfway to the anal angle; spur long, extending more than halfway to the base; apex hyaline without fuscous cells. Posterior femora unusually long and slender, with the disk of the inner face mostly light colored, a stripe on the basal half, a band in the middle of the apical half, and the knee blackish. Posterior tibiæ obscure whitish, unbanded.

Length of body, male, 19½ mm.; length of tegmina, 22½ mm.; length of posterior femora, 12 mm. One male, Los Angeles, California. Bruner collection.

The species was based upon a single male from Los Angeles. The only specimen I have seen is a male from this locality, marked type, but it differs quite remarkably from the measurements given by Bruner and is therefore probably not the specimen upon which the species was originally based.

VINCULATA group.

Frontal costa distinctly sulcate, with the carinæ distinct to the central foveolæ, but rarely reaching the clypeus; above the ocellus usually less deeply sulcate than below, but never full and rounded; scutellum of the vertex moderately or deeply sulcate, only rarely not plainly longer than broad, with the median carina usually distinct; median and lateral foveolæ distinct; eyes never longer than the genal groove even in the males, plainly shorter in the females. Pronotum with the median carina barely cristate on the prozone, a raised line on metazone; the latter from one and three-fourths to twice as long as the former; lateral lobes without a tooth. Tegmina distinctly banded, with the bands at the ends of the first and second quarters plainly darker (except in deeply infuscated specimens), and though generally irregular and variable in shape and size, not a mere aggregation of annular spots, but solid or semisolid; spots proximal to the base, for the most part smaller than those on the apical third and few of them annular; light areas beyond the basal and median bands nearly or quite free from fuscous spots, the proximal one generally somewhat V-shaped and wider on the anterior margin; last branch of the radial sector distant from the fork about a third (female) generally more than a third (male) of the length of the sector; median and cubital forks never fused, but generally connected by a short cross vein; intercalary vein in its apical half separated from the median by scarcely more than its own width even in the females; wings yellow or greenish yellow at the base, with a distinct fuscous band; apex hyaline, rarely with any fuscous spots near the apex; second dividing vein joining the second anal vein much behind the middle. Posterior femora with the disk of the inner face black with two light bands on the apical half. Posterior tibiæ obscure yellow or brown.

TRIMEROTROPIS SALINA Bruner, manuscript.

Size, medium; color, dark fuscous brown, obscurely maculate. Frontal costa considerably constricted above and below the ocellus; scutellum very broad, being very little longer than broad in the female, slightly longer in the male, moderately sulcate, with the median carina scarcely distinct. Pronotum with the median carina scarcely cristate on the prozone and quite distinct on the metazone. The latter is not more than one and three-quarters times as long as the former and has the disk very evenly and finely granulate, with the process obtuse-angular, the sides straight, and the tip very plainly rounded. Tegmina broad, with the usual markings made little conspicuous by the dark ground color. Wings rather broad, being considerably less than twice as long as broad, with a broad fuscous band occupying not much less than a third the length of the wing, extending on the posterior border much more than halfway to the anal angle. Spur short, reaching less than halfway to the base; apical portion hyaline with a few fuscous spots. Posterior femora without fuscous bands externally; lower sulcus black, with two light bands on the apical half. Posterior tibiæ obscure fuscous, with a faint subbasal annulus.

Length of body, male, 22 mm., female, 29 mm.; length of tegmina, male, 23 mm., female, 30 mm.; length of posterior femora, male, 12 12 mm., female, 14½ mm.

One male and one female, Salt Basin, Lincoln, Nebraska, Bruner collection. One male and one female in the collection of Stanford University.

This species is easily recognized by the broad fuscous band of the wings and the dark hind tibiæ.

TRIMEROTROPIS SIMILIS Scudder.

Trimerotropis similis Scudder, Second Rept. U. S. Ent. Com., App. II, 1880, p. 27.

This species is very closely related to both of the preceding. In the structure of the head and pronotum is not distinguishable from *Trimerotropis vinculata*. The wings are precisely similar with the fuscous band, narrow and distinct as in that species, and the apex unspotted, but the general color of the tegmina and body is quite distinct. The head, body, and limbs are nearly uniform dark brown. The tegmina have two fairly lighter bands in the usual position, one beyond the basal third and the other just beyond the middle of the wing and almost no visible spots anywhere.

Length of body, male, 22 mm., female, 28 mm.; length of tegmina, male, 24 mm., female, 27 mm.; length of posterior femora, male, 11 mm., female, 13 mm.

Wallula, Washington, Scudder; Washington, Bruner. I have examined two specimens from The Dalles, Oregon, from the Bruner collection.

TRIMEROTROPIS PALLIDIPENNIS Burmeister.

Œdipoda pallidipennis BURMEISTER, Handl., Ent., II, p. 641.—THOMAS, Acrid. N. Am., 1873, p. 218.
Œdipoda straminea EHRICHSON in Schomburgk, Faun. et Flor. Brit. Guyan., p. 582.
Trimerotropis pallidipennis SAUSSURE, Prodr. Œdip., 1884, p. 171.

Size, small or medium; color, light brown; head, pronotum, and abdomen thickly punctate with minute fuscous spots, tegmina very conspicuously banded. Frontal costa less decidedly sulcate and broader than usual in this group with that part above the ocellus scarcely narrowed below the scutellum, which is very moderately sulcate with the median carina indistinct and but little longer than broad. Pronotum with the median carina strongly cristate with the lobes not very unequal on the prozone, and scarcely perceptible on the metazone which is very nearly twice as long as the prozone; metazone with the disk roughened with larger granulations, some of which are distinctly linear; process of the metazone a little greater than a rectangle, with the sides very slightly arcuate and the tip sharp. Tegmina very narrow and strongly falcate on the apical third, the usual bands similar to those of *Trimerotropis vinculata* in structure and position. Wings broader with the costal margin much more strongly arcuate, but with the apex quite as attenuate as in that species; disk greenish yellow, somewhat more transparent than usual and very large, the fuscous band being entirely beyond the center of the wing; fuscous band very narrow, but quite uninterrupted and very distinct, continued on the posterior about halfway to the anal angle, with the spur very long, extending two-thirds of the way to the base; apical portion unusually small, hyaline without spots. Posterior femora rather indistinctly banded on the outer face, the lower sulcus black with two lighter bands on the apical half. Posterior femora, obscure yellow with a faint lighter subbasal annulus.

Length of body, female, 27½ mm.; length of tegmina, 29 mm.; length of posterior femora, 12 mm.

One female Carcarana, Argentina, South America, Bruner's collection. The species is known to me only through a single specimen, but seems very distinct in the tegmina and wings.

TRIMEROTROPIS COLLARIS, new species.

Size small, color clay yellow, head and abdomen plain, pronotum moderately and tegmina always very conspicuously banded and spotted with fuscous. Scutellum narrow, deeply sulcate, with the median carina moderately distinct and elongate, being one and a half (female) or twice (male) as long as wide. Pronotum very short and broad, the length being equal to (female) or barely greater (male) than the width, with the median carina strongly elevated on the anterior of the prozone and much depressed at the posterior border; metazone, with the disk, moderately smooth, with a few larger granulations, which tend to run into lines; the process strongly obtuse angulate, with the borders straight and the tip rounded. Tegmina narrow, long, and very conspicuously banded, as in bright-colored specimens of *Trimerotropis vinculata*. Wings very similar to that species, with the disk pale citron, instead of greenish yellow. Posterior femora distinctly or strongly banded externally, with the lower surface black with a single subapical light band. Posterior tibiæ obscure yellow, with an inconspicuous light subbasal annulus.

Length of body, male, 19 mm., female, 25½ mm.; length of tegmina, male, 24 mm., female, 27½ mm.; length of posterior femora, male, 11 mm., female, 13½ mm.

San Jose del Cabo, Mexico.

One male and one female from the collection of the California Academy of Sciences.

The species is easily distinguished from *Trimerotropis vinculata* by its small size and very short and broad pronotum.

TRIMEROTROPIS FRATERCULA, new species.

Size small, color light reddish brown, head livid, rest of the body and limbs thickly but not very conspicuously maculate with fuscous, tegmina conspicuously maculate. Frontal costa decidedly narrowed above and below the ocellus, the lateral carinæ fading before reaching the clypeus; scutellum moderately broad and not narrower proportionally in the male than in the female; median carina scarcely distinct. Pronotum with the median carina scarcely cristate even on the prozone, very distinct on the metazone, seen from the side not bilobate; metazone nearly twice as long as the prozone; metazone with the disk finely granulate, many of the granulations exhibiting a tendency to run into lines; metazonal process acute-angled with the sides barely arcuate and the tip sharp. Tegmina broad with the usual bands distinct but more obviously composed of aggregations of small spots than usual in this group; area of the cubital forks filled with several series of polygonal cells even in the male; last branch of the radial sector nearer the fork than usual in the group, being distinct little more than one-fourth (female) or one-third (male) the length of the sector. Wings broad, being about one and three-fifths times as long as broad; disk light yellow with the fuscous band moderately broad and distinct but interrupted narrowly behind the spur, continued along the posterior margin decidedly less than halfway to the anal angle, with the spur long, extending rather more than halfway to the base; apical portion hyaline without fuscous spots. Posterior femora banded more or less distinctly exteriorly, lower sulcus black with one subapical light band. Posterior tibiæ obscure yellow, faintly clouded with brown apically and on the basal half, where it is interrupted by a faint, light annulus.

Length of body, male, 18 mm., female, 25 mm.; length of tegmina, male, 20 mm., female, 25 mm.; length of posterior femora, male, 10 mm., female, 12½ mm.

One male and one female, Pine Bluffs, Wyoming. Bruner collection. Readily distinguished by its small size and the character of the wing and wing markings.

TRIMEROTROPIS VINCULATA Scudder.

Trimerotropis vinculata SCUDDER, Ent. Notes, V, 1875–76, p. 25; App. II, Second Rept. U. S. Ent. Com., 1880, p. 27, pl. XVII, fig. 11.—BRUNER, Bull. Wash. Coll., I, 1885, p. 134.

Trimerotropsis cincta SAUSSURE, Prodr. Œdip., 1884, p. 171.

Size medium to large; color light or dark brown, much varied with fuscous; scutellum strongly sulcate, with the median carina about as distinct usually as the lateral, these divergent and plainly angulate opposite the front margin of the eyes; eyes as long as the genal groove in the male. Pronotum with the median carina moderately cristate; the anterior lobe of the crest of the prozone considerably longer than the posterior lobe; metazone nearly twice as long as the prozone, its disk finely granulate without any scattered larger granulations; process of the metazone slightly acute-angular, with the sides straight and the tip plainly rounded. Tegmina with the bands moderately or very distinct, the base being usually suffused with reddish brown which gradually becomes diluted farther from the base. The area of the cubital forks is never very broad, occupied by several rows of polygonal cells (female) or by one row (at least at the base) of subquadrate cells (male). Wings long, scarcely less than twice as long as broad, with the posterior margin nearly straight and parallel with the anterior, the apex drawn out and attenuated; disk, varying shades of yellow, sometimes tinged with blue; fuscous band very distinct and rather narrow, rarely as much as one-sixth the length of the wing, with the spur short, extending plainly less than halfway to the base, on the posterior margin crossing the eighth lobe and reaching much beyond the middle, rarely it fades scarcely beyond the middle. Posterior femora generally distinctly banded on the outer face; lower sulcus black with one light subapical band. Posterior tibiæ obscure yellow without any distinct subapical light annulus.

Length of body, male, 22 to 24 mm., female, 29 to 30 mm.; length of tegmina, male, 25 to 28 mm., female, 30 to 33 mm.; length of posterior femora, male, 12 to 12½ mm., female, 14 to 15 mm.

Western North America, extending eastward to middle Nebraska, Kansas, and Texas, the edge of the Great Plain.

A common species not confined to barren ground, but common along roadsides and in dry, cultivated fields.

TRIMEROTROPIS SAXATILIS, new species.

Trimerotropis verruculata THOMAS, Ninth Rept. Ent. Ill., 1880, p. 112.

Very similar to *Trimerotropis vinculata* and possibly not distinct from that species, but differing in the following particulars:

Scutellum broader; pronotum with the metazone not more than one and three-quarter times as long as the prozone, with the process rectangular. Tegmina, as well as the whole body and limbs, excepting the lower surface of the head and abdomen, extremely variable in color, the ground color being white, bluish green, or brown, generally very strongly varied with fuscous, but sometimes nearly plain by the suffusion of the ground color with fuscous. Wings shorter relatively as well as positively, being considerably less than twice as long as broad; fuscous band broader, being from one-fourth to one-fifth the length of the wing, extending along the posterior border much beyond the middle; apex hyaline, with many or few fuscous spots. Posterior femora with the lower sulcus black, crossed by two white bands on the apical half, the median not completely cutting the black. Posterior tibiæ varying with the color of the femora; the prevailing color greenish, with a lighter, generally conspicuous, subapical annulus.

Length of body, male, 20 to 22 mm., female, 27 mm.; length of tegmina, male, 22 to 23 mm., female, 26 mm.; length of posterior femora, male, 12 mm., female, 13 mm.

Southern Illinois, Thomas; Union County, Illinois (French collection); Arkansas.

In Arkansas the species is found only on rocky ground, and its color varies with the surroundings. Where the exposed rocks are light colored or white and covered with lichens the individuals will be white, green, and black in color and so thoroughly protected that it is quite impossible to see them when at rest.

TRIMEROTROPIS PILOSA, new species.

Size small, colors plain or dark, but the tegmina conspicuously banded. Head, thorax, and limbs conspicuously hairy. Scutellum very broad, even in the male, but moderately long, being one and a quarter times as long as broad; deeply sulcate, with the median carina distinct. Pronotum with the median carina very moderately cristate on the prozone; metazone nearly twice as long as the prozone, its disk finely and evenly granulate, and the metazonal process decidedly obtuse angular, the sides straight and the tip rounded. Tegmina with the usual bands distinct, the basal one unusually broad and plainly encroaching upon the light band just beyond it, which is unusually narrow. Wing very broad, being less than one and a half times as long as broad, with the tip not at all attenuate; fuscous band rather narrow, scarcely more than a fifth the length of the wing in width, but very distinct, continued upon the posterior margin more than halfway to the anal angle; spur short, extending plainly less than halfway to the base; apical portion hyaline without fuscous spots. Posterior femora not plainly banded exteriorly, with the lower sulcus obscurely infuscated rather than black, with one or two indistinct light bands on the apical half. Posterior tibiæ deep brown darker on the basal half, where this color, however, is interrupted by a lighter annulus.

Length of body, male, 16½ mm.; length of tegmina, 20 mm.; length of posterior femora, 9½ mm.

One male, Palo Alto, California, March 17; Stanford University collection.

This species is the smallest *Trimerotropis* known to me, easily recognized by its broad wings, brown posterior tibiæ, and unusually hairy body. Another specimen from Palo Alto, which I would refer to *Trimerotropis vinculata*, without doubt, except for the fact of its having the right posterior tibia yellow, while the left one is deep brown. It is not unlikely a hybrid produced by these species.

FALLAX group.

Brown, more or less deeply infuscated and maculate. Frontal costa sulcate below the ocellus, but, except for a very short distance, full, rounded, and punctate above. Scutellum of the vertex much longer than wide, with the central foveolæ only feebly biarolate but very distinct, lateral foveolæ only a little less distinct. Pronotum with the dorsum rather flat and the shoulders well marked, with lateral carinæ distinct on the front of the prozone at least; median carina cristate on the prozone, scarcely more than a raised line on the metazone; the latter from once and a half to twice as long as the prozone, with its dorsum furnished with a few larger granulations; lateral lobes never toothed. Tegmina broad, with the maculations distinctly annular and scattered pretty evenly over the whole surface or rarely gathered into the usual bands; last branch of the radial sector distant from the fork about one-fourth the length of the sector. Wings never more than twice as long as wide, with the outer half fuscous or the apical part fuliginous or rarely only infuscated at the tip; the spur long, reaching fully half way to the base; the disk yellow. Posterior femora with the disk of the inner face black, with two light bands on the apical half; lower sulcus black, with one light subapical band. Posterior tibiæ never bright red.

The species in this group all bear a strong resemblance to Circotettix, especially to *Circotettix suffusus* and *obscurus* Scudder and *verruculatus* Kirby. They are all closely related, and may prove to be varieties of a single species.

TRIMEROTROPIS FALLAX Saussure.

Trimerotropis fallax SAUSSURE, Prodr. Œdip., 1884, p. 170.

Very similar to the preceding species, from which it may be distinguished by the following characters: Scutellum of the vertex moderately sulcate, with the median carina always apparent and usually distinct. Pronotum with the anterior margin not plainly angulate and the process of the metazone slightly obtuse-angular, the angle sharp and the sides straight, not sinuate in the least; metazone twice as long as the prozone. Tegmina with the maculations quite evenly scattered (sometimes faint) over the whole surface, with scarcely a trace of the usual bands, the apex distinctly obliquely truncate instead of evenly rounded.

Length of body, male, 22 mm., female, 27 mm.; length of tegmina, male, 23 mm., female, 30 mm; length of posterior femora, male, 12 mm., female, 14 mm.

One male and one female, Placer County, California; Bruner collection. Three males and one female, Placer County, California; U. S. National Museum: California, Saussure, Koebele.

TRIMEROTROPIS NUBILA, new species

Color variable, but maculations usually distinct. Frontal costa only slightly constricted below the ocellus; scutellum of the vertex shallowly sulcate, with the median carina indistinct. Pronotum with the anterior margin distinctly augulate, and the process of the metazone rectangulate and sharp, with the margins slightly sinuate; the median carina is moderately cristate on the prozone, with the front lobe nearly twice as long as the second; the lateral carinæ are distinct on the front of both prozone and metazone. The tegmina have the annular fuscous spots gathered into two somewhat distinct bands; the maculations on the distal two-fifths are about as numerous in the middle as along the margins of this area; the intercalary vein is separated from the median by once its width; the distance between the radial and median forks is considerably greater than the width of the anterior field; the radial sector has three or four forks; the median and cubital veins do not fuse at the end of the intercalary area, but are free or connected by a cross vein; the anterior fork of the cubitus furcates near its base. The wings are moderately broad, scarcely twice as long as broad, with the disk greenish-yellow and the rest of the wing infuscated, or the subapical portion merely infumated; the fuscous band does not extend beyond the fifth lobe, or less than halfway to the anal angle; the median stem joins the radius a little more than one-third the length of the wing from the base, and the latter forks halfway between this point and the apex. The second dividing vein joins the second anal one-third the distance from the base to margin. The posterior femora are more or less distinctly banded on the outer face with fuscous. The posterior tibiæ are steel-blue with a light subbasal and a fuscous basal ring.

Length of body, male, 22 mm., female, 27 mm.; length of tegmina, male, 23 mm., female, 29 mm.; length of posterior femora male, 11 mm., female, 13 mm.

One male, Hot Springs, New Mexico, 7,000 feet altitude; Bruner collection.

The species is closely related to *Trimerotropis fallax* Saussure, from which it is readily distinguished by the distinct bands of the tegmina and the obtuse-angled process of the metazone.

TRIMEROTROPIS CONSPERSA, new species.

Very closely related to *Trimerotropis fallax*, from which it may not be specifically distinct. Scutellum of the vertex somewhat narrower than in that species, being fully one and a half times as long as broad and deeply sulcate, with the median carina distinct. Wings somewhat longer, being very nearly twice as long as broad, with the disk faintly tinged with very pale citron instead of greenish yellow. Hind tibiæ obscure yellow or red, without any distinct pale subbasal annulus.

Length of body, male, 25 mm., female, 28 mm.; length of tegmina, male, 25 mm., female, 30 mm.; length of posterior femora, male, 13 mm., female, 14 mm.

One male, Mount Shasta, California, September, 1885, J. Behrens, collector. One female, Shasta County, California, July, J. Behrens, collector. Bruner collection.

TRIMEROTROPIS VARIEGATA, new species.

This species is closely related to *Trimerotropis conspersa* from which, however, it is readily distinguished. Scutellum somewhat narrower than in the preceding species, being nearly twice as long (not including the central foveolæ) as broad, dully sulcate, with the median carina distinct. Pronotum with the anterior lobe of the carina of the prozone very little longer than the posterior; metazone plainly less than twice and scarcely one and three-quarter times as long as the prozone, with its process strongly obtuse-angulate, the sides straight, and the tip slightly rounded. Tegmina with the usual annular spots plainly collected into three groups, the basal one quite distinct and the apical very indistinct; nearly all the middle beyond the anterior cubital fork hyaline except for the veins and spots. Wing considerably less than twice as long as broad (26 by 15 mm.), with the disk very faint yellow, the fuscous band with a spur extending much more than halfway to the base and including less than five lobes on the exterior margin and reaching much less than halfway to the base; apical third hyaline except for the fuscous veins and an apical fuliginous cloud.

Posterior tibiæ exactly as in *Trimerotropis*.

Length of body, male, 20 mm., female, 25 mm.; length of tegmina, male, 21¼ mm., female, 29 mm.; length of posterior femora, male, 9¼ mm., female, 12 mm.

Type.—Cat. No. 5374, U.S.N.M.; Tighes Station and Julian, southern California, Scudder. The species is known to me by this single specimen, a female. It is without a locality label.

CAERULEIPENNIS group.

Size medium, color brown or gray, considerably varied with darker spots. Scutellum of the vertex much (male) or little (female) longer than broad; central and lateral foveolæ distinct; eyes as long (male) or decidedly (female) shorter than the genal groove. Pronotum with the lateral carinæ wanting; anterior lobe of the crest of the prozone not much longer than the posterior. Tegmina with the annular maculations distinctly segregated into three bands; intercalary vein in the apical half separated from the median by a space not greater than (male) or plainly greater than (female) its width; last branch of the radial sector distant from the fork from one-third to one-half the length of the sector; area of the cubital forks filled with irregular cells in several rows; median and cubital forks not fused, free or connected by a short vein; anterior fork of the cubitus forking near the base. Wings with the disk blue, fuscous bands present or plainly indicated by infuscated veins and cells. Posterior femora black on the disk of the inner face, with two light bands on the apical half; plainly but not conspicuously banded on the outer face. Posterior tibiæ blue, with a lighter subbasal annulus.

TRIMEROTROPIS CAERULEIPENNIS Bruner.

Trimerotropis cærulеipennis BRUNER, Can. Ent., XVII, 1885, p. 10.

Scutellum distinctly wider than in *cyanipennis*, with the median carina distinct, especially in front. Pronotum with the anterior margin distinctly angulate; median carina strongly cristate upon the prozone; metazone with the disk finely granulate, its process right (male) or obtuse angulate (female), the sides slightly arcuate and tip scarcely rounded. Wings long and narrow, being twice as long as wide; disk light blue, bordered exteriorly by the usually incomplete and narrow fuscous band which, when present on the exterior border, reaches much less than halfway to the anal angle; apical two-fifths hyaline without any infuscated cells. Posterior tibiæ light blue with a distinct light annulus, which is sometimes intensified on the outside by a white cloud.

Length of body, male, 18 mm.; female, 28 mm. Length of tegmina, male, 23 mm.; female, 31 mm. Length of posterior femora, male, 12 mm.; female, 15 mm.

Los Angeles, California, Bruner. I have seen Bruner's types in the U. S. National Museum, and I have typical specimens from him from Los Angeles, California, and Camp Umatilla, Wyoming.

TRIMEROTROPIS CYANEIPENNIS Bruner.

Trimerotropis cyaneipennis BRUNER, Proc. U. S. Nat. Mus., XII, 1890, p. 68.

Scutellum of the vertex narrow; median carina indistinct. Pronotum with the anterior margin scarcely angulate; median carina scarcely cristate even on the prozone; disk of the metazone smoothly granulate, sometimes with a few scattered larger granulations; metazone nearly twice as long as the prozone, with its process scarcely acute-angular, the sides straight and the tip slightly rounded. Wings not quite twice as long as broad; disk deep blue, with a moderately broad distinct black band, which sends a spur a little more than halfway to the base and is continued on the exterior margin never more and usually much less than halfway to the anal angle; apex hyaline, without any infuscated cells. Posterior tibiæ deep blue, with a pale basal or subbasal annulus, sometimes suffused on the outside with brown.

Length of body, male, 23 mm.; female, 30 mm. Length of tegmina, male, 23 mm.; female, 31 mm. Length of posterior femora, male, 12 mm.; female, 5½ mm.

Habitat.—Salt Lake Valley, Utah, Bruner. I have seen Bruner's types in the U. S. National Museum, also specimens from Grand Canyon and Flagstaff, Arizona. Bruner says of this species: "It frequents rather well-clothed surfaces among the rocky talus of mountain sides."

AZURESCENS group.

Frontal costa distinctly sulcate, but very briefly above the ocellus; scutellum always plainly longer than wide, but less obviously in the females; central and lateral foveolæ distinct. Pronotum with the metazone nearly twice as long as the prozone, at least plainly more than once and a half as long; median carina low and very slightly cristate, even on the prozone; lateral carinæ obsolete. even on the front part of the prozone, but the disk plain and shoulders well marked; lateral lobes never toothed; process of the metazone rectangular or acute. Tegmina maculate with annular spots, which are generally collected into quite irregular and ill-defined bands, one occupying the basal third, another the middle, and the last the apical third; middle field beyond the median and cubital forks largely hyaline; intercalary vein on its apical half close to the median, at same point separated from it by about once its width; the median is free from the cubitus at the end of the intercalary field or united with it by a short vein, but never fused with it. Wing without any trace of a fuscous band except sometimes in the infuscations of the veins of the area usually occupied by the band; hyaline, with the base very faintly tinged with blue, or greenish; dividing vein of the second anal uniting with the second anal one-third the length of the latter from the base. Posterior femora with the disk of the inner face black with two light bands on the apical half; lower sulcus black or more or less infuscated with two light bands on its apical half. Posterior tibiæ never red nor blue, yellowish or obscure.

TRIMEROTROPIS AZURESCENS Bruner.

Trimerotropis azurescens BRUNER, Proc. U. S. Nat. Mus., XII, 1890, p. 69.
Trimerotropis perplexa BRUNER, Proc. U. S. Nat. Mus., XII, 1890, p. 74.

Size medium; color varying from grayish-white to dull brown, much but not conspicuously varied with fuscous.

Frontal costa sulcate for a considerable distance above the ocellus; scutellum of the vertex only moderately (female) or deeply (male) sulcate, a little (female) or much longer (male) than wide, with the median carina distinct though slight; eyes plainly shorter than the genal groove. Pronotum with the median carina low, even upon the prozone, and barely cristate; posterior lobe of the crest of the prozone conspicuously longer than the posterior lobe; lateral carinæ entirely wanting on the metazone and scarcely visible on the anterior part of the prozone; metazone finely granulate without larger scattered granulations, nearly twice as long as the prozone, with its process acute angular, sides straight, and tip slightly rounded. Tegmina much varied, with slightly contrasting, not very dark, annular spots, which are very imperfectly segregated into the three bands typical of the genus; area of the cubital fork in the male occupied by a single series of cells, at least at the base in the male; this area very variable in the female. Wings broad, but much more decidedly in the females; in the former scarcely, in the latter fully two-thirds as long as broad; hyaline, faintly tinged with blue or greenish, especially on the anal portion of the radiate field, with fuscous band only faintly indicated in some specimens by infuscation of the veins. Posterior femora plain on the outer face or very inconspicuously banded. Posterior tibiæ obscure yellow, with indefinite brownish clouds on the basal half and apically.

Length of body, male, 22 mm., female, 29 mm.; length of tegmina, male, 24 mm., female, 30 mm.; length of posterior femora, male, 12 mm., female, 14 mm.

Habitat.—Fort Benton, Montana, United States National Park, Wyoming, Lemhi or Salmon River, Idaho; Chadron, Nebraska, Bruner; Alkali Stage Station, Green River, Wyoming, Scudder. I have seen specimens of *azurescens* from Fort Benton, Montana, and Salmon City, Idaho, from Doctor Bruner's collection, also Bruner's types in the U. S. National Museum, and in the same collection specimens from Yellowstone, Montana. I have specimens of *perplexa* from Chadron, Nebraska, determined by Doctor Bruner.

A careful examination of these specimens fails to show any constant difference, and I am compelled to believe them synonymous. Bruner says of *perplexa:*

> It produces a very decided clatter upon the wing. According to the same authority it is a bare-ground species, living upon stunted chenopodiaceæ, which manages to live in the alkali flats, where it abounds.

TRIMEROTROPIS PSEUDOFASCIATA Scudder.

Trimerotropis pseudofasciata Scudder, App. J. J. Ann. Rept. Chief Eng., 1876, p. 514.

Size medium; color usually light brown, rather strongly varied with fuscous maculations. Frontal costa rather strongly sulcate above as well as below the ocellus, with the carinæ gradually diverging from immediately below the ocellus to the clypeus; scutellum of the vertex much longer than wide, strongly sulcate with the median carina faint, but continued across the occiput to the pronotum; eyes decidedly longer than the genal groove. Pronotum with the anterior margin plainly angulate; median carina more than usually cristate, with the anterior lobe of the prozonal crest only slightly longer than the posterior lobe; disk of the metazone with a few larger granulations which show a tendency to run together into lines; process of the metazone rectangular, with the sides straight and the apex rounded; metazone a little less than one and three-quarter times as long as the prozone. Tegmina long and slender, with the usual bands distinct, but obviously composed of annular spots, the basal one with its inner margin distinguishable from the spots between it and the base of the wing; only the apical third is distinctly hyaline; area between the cubital forks wide, occupied by several series of polygonal cells. Wing narrow, twice as long as broad, hyaline with the disk tinged with very dilute dull yellow, fuscous band represented only by a darkening of the veins and occasionally by some smokiness in a few of the cells in area usually occupied by the band. Posterior femora rather distinctly banded on the outer face. Posterior tibiæ obscure yellow with traces of three brownish clouds, one basal, another near the middle, and a third apical.

Length of body, male, 22 mm., female, 24 mm.; length of tegmina, male, 25 mm., female, 27 mm.; length of posterior femora, male, 10½ mm., female, 12.2 mm.

Santa Cruz Island, San Diego, Scudder; San Joaquin Valley, Coquillett. I have seen one of Scudder's type specimens in the U. S. National Museum from Santa Cruz Island and have examined a male of the typical specimens from San Diego collected by Palmer.

According to Coquillett this species occurs in destructive numbers in the Joaquin Valley. In 1885 he estimated that it was one-twentieth as abundant as the Devastating Locust (*Melanoplus devastator*). Early in June the species was most abundant in grain fields, but after harvest it did considerable injury to grapevines and low trees. They do not migrate in swarms, but apparently quite independent of each other fly with or against the wind at will. They occasionally make the crackling sound while flying which is especially characteristic of *Circotettix*. When at rest they seem to prefer the bare ground, but seek the shade in the hottest part of the day. They readily eat dry leaves and the bodies of their dead companions. The eggs are laid in bare fields. Mr. Coquillett has given the name of Yellow Locust to this species, which appears to be very suitable.

TRIMEROTROPIS LAUTA Scudder.

Trimerotropis lauta SCUDDER, Ent. Notes, V, 1875–76, p. 26.

Small or medium, brown much varied with fuscous maculations, occasionally plainer, except the tegmina, which are always distinctly maculate. Scutellum of the vertex very deeply sulcate, with the median carina faint, but continued upon the occiput, nearly twice as long as broad; eyes a little longer (male) or a little shorter (female) than the genal groove. Pronotum with the disk flat and the lateral carinæ barely apparent on the front of the metazone and prozone; median carina less prominent on the prozone than in *Trimerotropis pseudofasciata* and scarcely cristate, with the anterior lobe of the crest of the prozone plainly longer than the posterior lobe; metazone nearly twice as long as the prozone, with the disk smooth with a few scattered larger granulations; metazonal process acute, rectangular, or obtuse in the same sex, with the sides straight and the apex barely rounded. Tegmina thickly maculate with annular spots, which exhibit only a trace of the usual arrangement into three bands; area of the cubital forks occupied by a single row of cells in the male, in the female by about two rows at least proximally. Wings narrow, but not quite twice as long as broad, hyaline even on the disk, and without a trace of the usual fuscous band even in the veins. Posterior femora distinctly banded on the outer face. Posterior tibiæ as in the preceding species, with the markings more distinct.

Length, male, 19 mm., female, 26½ mm.; length of tegmina, male, 18 mm., female, 25 mm.; length of posterior femora, male, 9 mm., female, 12 mm.

Habitat.—Lower California, Guadalupe Island, Scudder. I have one of Dr. Scudder's types and a number of specimens from Guadalupe Island in the museum of Stanford University.

This species is doubtless restricted to Guadalupe Island, and while very closely related to the preceding species, it is probably distinct.

DESCRIPTION OF PLATE XXI.

FIG. 1. Right tegmen of *Trimerotropis saxatilis.* *1st A* and *2d A*, first and second, anal veins; *c. v.*, cross veins at end of area *M; Cu*, cubitus, Cu_1 and Cu_2, forks of cubitus; $Cu_1 1$, branch of Cu_1; *I*, intercalary vein; *M*, media; $M_{1\,\&\,2}$ and $M_{3\,\&\,4}$, forks of *M; R*, radius; R_1 and R_s, first fork of radius and radial sector; $R_s 1$, $R_s 2$, $R_s 3$, first, second, and third branches of R_s; *Sc.*, subcosta.

FIG. 2. Right wing of *Trimerotropis saxatilis.* The letters and numerals have the same significance where they are the same, and in addition *3d A*, third anal vein; *2d* A_1 and *2d* A_s represent the first fork and the sector of *2d A;* *2d* $A_s 2$, second, branch second *A;* $R_{2\,\&\,3}$ and $R_{4\,\&\,5}$, second and third, and fourth and fifth forks of the radius; *3d* A_1, *3d* A_2, etc., first, second, etc., branches of third *A; C*, costa; *S*, spurious veins.

FIG. 3. Right tegmen of *Metator pardalina* Sauss. *I*, intercalary vein; *S*, spurious veins dividing areas formed by the accessory branches of the principal veins.

FIG. 4. Right wing of *Circotettix undulatus* Thomas. *Ant.*, anterior field; *Mid.*, middle field; *Post.*, posterior field; *R*, radiate veins, branches of *2d* and *3d A; G*, interplical grooves occupied by spurious veins.

FIG. 5. Right tegmen of *Conozoa wallula* Scudder.

FIG. 6. Right tegmen of *Derotmema haydenii* Thomas.

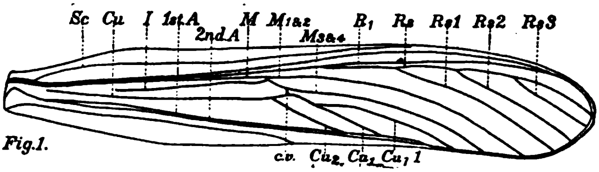

Fig. 1.

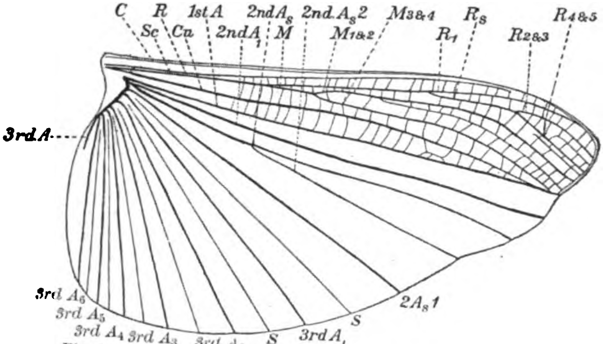

Fig. 2.

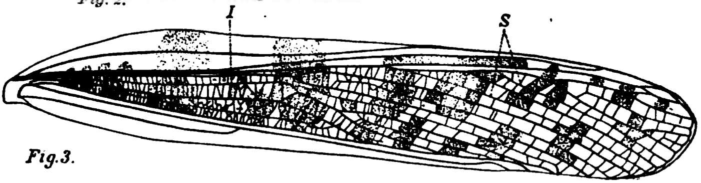

Fig. 3.

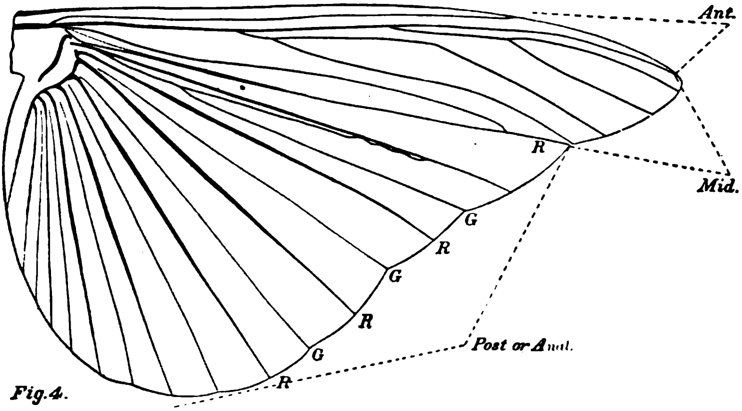

Fig. 4.

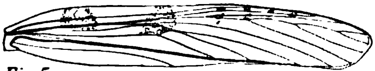

Fig. 5.

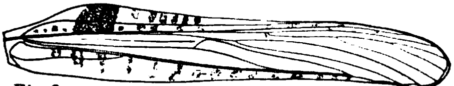

Fig. 6.

VENATION OF THE TRIMEROTROPIS.

FOR EXPLANATION OF PLATE SEE PAGE 449.

THE HERMIT CRABS OF THE PAGURUS BERNHARDUS TYPE.

By JAMES E. BENEDICT,
First Assistant Curator, Division of Marine Invertebrates.

It is the purpose of this paper to bring to notice that section of the genus Pagurus of which *P. bernhardus* is the type.

Pagurus bernhardus occurs in the shallow waters of northwestern Europe, and is represented by *P. acadianus* in the waters of northeastern North America; by *P. alaskensis*, *P. aleuticus*, and *P. ochotensis* in the waters of the northwest coast; by *P. patagoniensis* and *P. barbiger* in Patagonian waters.

Of these species *P. acadianus* and *P. alaskensis* are more nearly related than any others. Next is *P. bernhardus*, more closely related to the former two species than to *P. aleuticus*, which, in turn, is much more closely related to the first three than to the spiny-handed forms, *P. ochotensis*, *P. patagoniensis*, and *P. barbiger*.

In the author's opinion the validity of the specific distinctions made can only be contradicted, if at all, after more collecting has been done in intermediate localities, when it is possible that the more closely related American forms may be reduced to subspecies.

KEY TO THE SPECIES.

a. Hands granulated.
  b. Width of the left hand at base less than one-half of its length *bernhardus* (p. 452).
  b. Width of the left hand at base one-half of its length.
    c. Dactyles of the ambulatory feet not grooved on outer margin.
      d. Acicle slender, without serrate outer edge........*acadianus* (p. 454).
      d. Acicle broad, edge serrate........................*alaskensis* (p. 456).
    c. Dactyls of the ambulatory feet with a deep groove on the outer margin *aleuticus* (p. 460).
a. Hands spiny.
  b. Spines of the hands without black points.................*ochotensis* (p. 463).
  b. Spines of the hands with black points.
    c. Antennules much longer than the eyes............*patagoniensis* (p. 465).
    c. Antennules not as long as the eyes.....................*barbiger* (p. 466).

PAGURUS BERNHARDUS (Linnæus.)

Cancer bernhardus LINNÆUS, Syst. Nat., 1758, p. 631; Mus. Lud. Ulr., 1764, p. 454.—HERBST, Natur. der Krabben und Krebse, II, 1796, p. 14, pl. XXII, fig. 6.

Astacus bernhardus PENNANT, Brit. Zool., IV, 1777, p. 23, pl. XVII.—DE GEER, Mem. pour servir a l' Hist. des Insects, VII, 1778, p. 405, pl. XXII, figs. 3–12.—OLIVIER, Enc. Meth. Insects, VIII, 1791, p. 641.

Pagurus bernhardus FABRICIUS, Suppl. Ent. Syst., 1798, p. 411.—LATREILLE, Hist. des Crust. VI, 1805, p. 160; Gen. Crust. et Ins., I, 1807, p. 46; Consid. Genr. sur les Crust. des *Arach.* et des insect, 1810, p. 422.[1]—LAMARCK, Hist. des Anim. sans Vert., V, 1818, p. 220.—DESMAREST, Consid. sur les Crust., 1825, p. 173, pl. XXX, fig. 2.—MILNE EDWARDS, Ann. des Sci. Nat., 2d ser., VI, 1836, p. 266; Hist. Nat. des Crust., II, 1837, p. 215; Atlas du Regne Anim., 3d ed., Crust., pl. XLIV, fig. 2; Ann. des Sci. Nat., 3d ser., X, 1848, p. 59.—BELL, Brit. Crust., 1853, p. 171.—WHITE, Pop. Hist. Brit. Crust., 1857, p. 74.—BATE, Rept. Brit. Assoc., 1865, p. 52.—NORMAN, Rept. Brit. Assoc., 1868, p. 264.—BENEDICT, Ann. & Mag. Nat. Hist. (6), XVIII, 1896, p. 99.

Pagurus streblonyx LEACH, Malac. Brit., 1815, pl. XXVI, figs. 1–4.—LATREILLE, Encyc. Meth., 1825, pl. CCCIX, figs. 3–6.

Pagurus ulidianus W. THOMPSON, Rept. Brit. Assoc., 1843, p. 267.—BELL, Brit. Crust., 1853, p. 180.—WHITE, Pop. Hist. Brit. Crust., 1857, p. 76.—BATE, Rept. Brit. Assoc., 1856, p. 52.

Eupagurus bernhardus var. *A. granulata* and var. *B. granalata-denticulata* BRANDT, Middendorff's Sibir. Reise, Zool., 1851, p. 107.

Bernhardus streblonyx DANA, Proc. Acad. Nat. Sci., Phila., VI, 1852, p. 6.

Eupagurus ulidianus STIMPSON, Proc. Acad. Nat. Sci., Phila., X, 1858, p. 236.

Eupagurus bernhardus STIMPSON, Proc. Acad. Nat. Sci., Phila., X, 1858, p. 236.—HELLER, Crust. Sudl. Eur. 1863, p. 160.—HENDERSON, Proc. Royal Phys. Soc., IX, 1886, p. 68.—POCOCK, Ann. Nat. Hist., 6th ser., 1889, p. 427.

The anterior portion of the carapace is usually about as broad as long, varying in individuals to broader or longer. The three projections of the front are pointed; the median is a little in advance of the lateral, which are each armed with a single tubercular spine. The eye scales are suboval, armed just below the point with a spine which projects and gives the scales a sharp appearance. The eyestalks are stout, constricted in the middle, dilated at the cornea. The terminal joints of the antennula are a little in advance of the corresponding parts of the antenna. The acicle of the antenna is three-sided, slender, and smooth, except on the inner edge, where it is rough and hairy.

The right cheliped is stout and strong; in the smaller specimens it does not reach the tips of the ambulatory legs, while in older and larger specimens it often exceeds them in length. The upper surface of the carpus is armed with a number of short spines, the larger of which are in the inner marginal row. The hand is about one-third longer than the carpus; the dactyl is usually longer than the palm; its average length in 21 specimens was found to equal the breadth of the palm. The left cheliped is much smaller than the right and varies much in relative length, sometimes reaching the base of the dactyl of the latter, sometimes not to the middle of the palm. The width of the palm averages a little less than one-half of its length. The carpal and propodal joints of the ambulatory legs are spiny above; the dactyls are curved and twisted.

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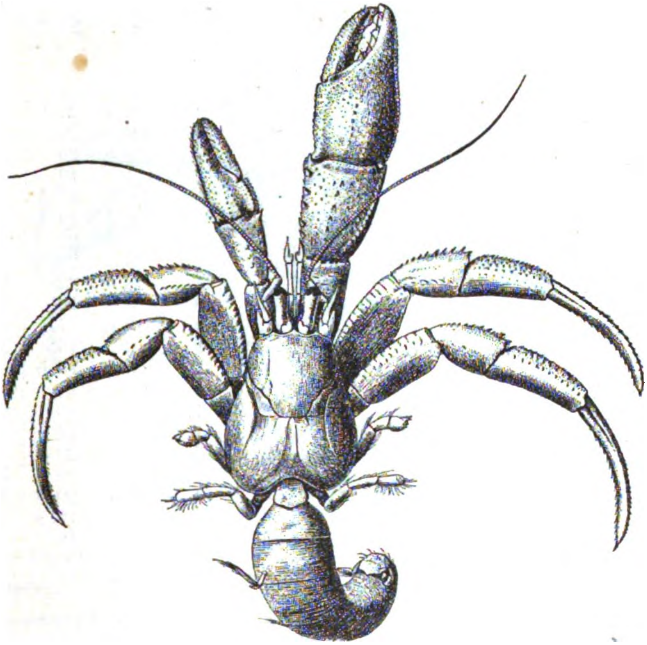
[1] *P. bernhardus* is here made the type of the genus.

A good description of the color can not be made from the specimens at hand. Stripes of red are shown on the three distal joints of the ambulatory legs. The upper surface of the hands, near the prehensile edges of the fingers and along the middle of the palm, is tinged with red. The measurements of the 21 specimens given below will probably show the average relative measurements of the species. The carapace is measured from the point of the median projection of the front to the margin of the hardened portion; the hand from the tip of the immovable finger to the middle of the margin when the hand is bent downward from the carpus; the dactyl from the tip to the condyle. Many of the specimens are worn. This will in part account for the more slender dactyls of the ambulatory legs, as the thin edges become worn in the movements of the animal over a rough bottom. The fact that the fingers of the large chelipeds are worn off at the tip also reduces their length in proportion to the width of the hand.



PAGURUS BERNHARDUS.

RECORD OF SPECIMENS EXAMINED.

Norway; G. O. Sars (Yale Univ. Mus.). Shetland; A. M. Norman (Yale Univ. Mus.). Firth of Clyde; John Murray (16988). Firth of Forth; A. M. Norman (16979). Channel Islands; Edward Lovett (6526). Jersey; A. M. Norman (6792). Holland (Yale Univ. Mus.). Europe (16980).

Measurements of Pagurus bernhardus.

Locality.	Length of carapace.	Length of large hand.	Length of dactyl of large hand.	Width of large hand.	Length of small hand.	Length of dactyl of small hand.	Width of small hand.	Length of dactyl of right anterior ambulatory leg.	Sex
British Isles	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	
(loc.?)	14.5	30.5	16	15	20	12.5	8.5	23.5	Male.
Do	16	32	18	17	20	13	9	26	Do.
Do	15	30	16	15	20	12.5	8.5	25	Do.
Do	12.5	23.5	12	12.5	15.5	10	7	19	Do.
Do	11.5	20	10	10	13	9	6.5	17.5	Do.
Do	11	21.5	11.5	11	14.5	9.5	6.5	19	Do.
Firth of Forth	14	24.5	12	13	17	11	7.5	22	Do.
Do	11.5	22	11	11	15	10	6	20.5	Do.
Do	16	26	12.5	14.5	19	11	8.5	22	Female.
Jersey	12.5	22	12	11	15	10	6	19	Male.
Do	12	20	10	10	13	9	6.5	17.5	Female.
Do	10.5	17.5	9	9	12.5	8	6	16	Male.
Do	10	17	9	9	11	8	5.5	15.5	Do.
Holland	10	18	9	9.5	12	8	6	14	Do.
Do	10	18.5	9	9	12.5	7.5	6	15	Do.
Do	9.5	18	8.5	8	12	7.5	5	16	Do.
Shetland	12.5	24	12	12	16	10.5	6.5	20	Do.
Norway	14.5	23	11	13	16	10	7.5	19	Female.
Channel Islands	12	24	12	12	16	10.5	6.5	20.5	Male.
Do	11	21.5	11	11	14	9.5	6	19.5	Do.
Do	12	21.5	11.5	10.5	14.5	9.5	6	19	Do.

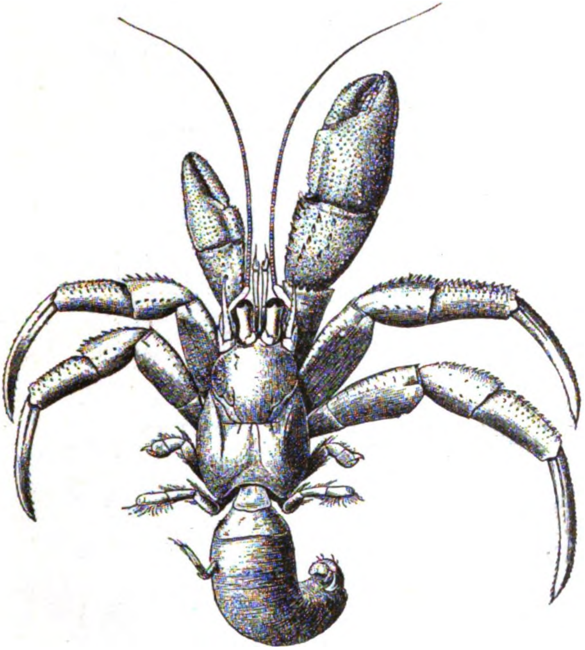
PAGURUS ACADIANUS, new species.

Pagurus bernhardus Gould, Invert. of Mass., 1841, p. 329.—De Kay, Nat. Hist. New York, Crust., 1843, p. 20.

Bernhardus streblonyx Stimpson, Marine Invert. of Grand Manan, 1853, p. 59.

Eupagurus bernhardus Stimpson, Ann. Lyc. Nat. Hist., New York, 1859, p. 89.—S. I. Smith, Rept. U. S. Fish Commr. for 1871 and 1872 (1874), p. 548; Trans. Conn. Acad., V, 1879, p. 46; Proc. U. S. Nat. Mus., III, 1880, p. 428; VI, pp. 28, 29, 1883, pl. v, fig. 1.—Smith and Harger, Trans. Conn. Acad., III, 1874, p. 27.—R. Rathbun, Fishery Industries of the U. S., 1st sec., 1884, p. 779.

A comparison of *E. bernhardus* from northwestern Europe with the common northeastern coast species of America has convinced me that they are specifically distinct. In both hands the fingers of *E. bernhardus* are much longer, in proportion to the length and breadth of the palm, than in *acadianus*. The granules of the hands in the American form are sharper than in the European species; especially is this true of the lower outer curve of the dactyl of the large hand, where in the American form the granules make a sharp and rather thin edge. The worn condition of the European specimens may account for a part of this difference. The eyestalks in the American form are relatively larger, as shown in fig. 1. The measurements of *acadianus* were made from specimens averaging larger than those with which they are compared. Much of the utility of the study of geographical distribution of a genus must be lost if forms closely related are grouped under one specific name. The name *bernhardus* as readily designates our species from its associates, *pubescens*, *kröyeri*, etc., as will *acadianus*, but the latter name will much better emphasize the difference separating it from the European species or from the more closely related North Pacific form.



PAGURUS ACADIANUS.

RECORD OF SPECIMENS EXAMINED.

From the Grand Bank of Newfoundland to the mouth of Chesapeake Bay, 7 to 265 fathoms, U. S. Fish Commission.

Station.	Cat. No.	Station.	Cat. No.	Station.	Cat. No.
240	3972	1165	5894	2082	5889
365	3916	1250	12803	2254	8695
865	5072	1251		2255	8694
900	4836	2017	5631	2576	11022
982	3348	2057	5965	2578	10793
983		2058	5952	2579	11023
990	5073	2081	5896		

Off Cape Sable, Nova Scotia, 16 fathoms (12604); Gloucester Harbor, Massachusetts, 7 to 10 fathoms (2564, 2610, 2849); off Cape Ann, 19 to 29 fathoms (2580, 2597); off Cape Cod, 10 to 34 fathoms (3338, 4582, 4583, 5034); Vineyard Sound, 17 fathoms (3882, 3884, 4542); off Gay Head (14397); Block Island Sound, 13 to 18½ fathoms (4543, 12853).

Gloucester donations.

Southwestern edge of Grand Bank, 200 fathoms (3721); off St. Peters Bank, 265 fathoms (3762); Georges Bank, 32 to 46 fathoms (3723, 3758–3760); off Plymouth, Massachusetts (3534); Grand Manan, New Brunswick, S. F. Cheney (12332).

Measurements of Pagurus acadianus.

Locality.	Length of carapace.	Length of large hand.	Length of dactyl of large hand.	Width of large hand.	Length of small hand.	Length of dactyl of small hand.	Width of small hand.	Length of dactyl of right anterior ambulatory leg.	Sex.
	mm.	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	
Georges Bank..	20	36	17	17.5	23	15	11	31.5	Male.
Do........	19.5	34.5	15.5	18	22	13	10	30	Do.
Do........	19.5	35.5	17.5	18	23.5	15	11	30	Do.
Do........	17	29.5	13.5	15.5	20	12	10	26	Do.
Do........	16.5	27	12.5	14.5	19.5	11.5	9	25	Do.
Do........	17.5	29	14	15.5	20	12.5	10	24.5	Do.
Off Cape Cod ..	16	21.5	10	12.5	16	9.5	8.5	19.5	Female.
Do........	13.5	25	9	11.5	15	8.5	8	18	Do.
Do........	14	23	11	10	16	11	8	20	Do.
Do........	11.5	20	9	10.5	13	8	6.5	18	Male.
Off Cape Ann..	15.5	28	12.5	14	19	12	9	23.5	Do.
Do........	13.5	25	10	12.5	15	9	8	18.5	Do.
Do........	13	21	10	11	15	9	7.5	19	Do.
Off Marthas Vineyard....	11	19.5	8.5	10	13.5	8	6.5	18	Do.
Do........	13	22	10	12	15	9.5	8	20	Do.
Do........	11.5	18	9	10	14	8	6.5	17	Do.
Vineyard Sound	11	17	7.5	10	12.5	7	7	14.5	Female.
Do........	10	12.5	6	7	11	6.5	5	14	Male.
Do........	10	17	7.5	9.5	12	7	6	15	Female.
Do........	10	16	7	9.5	12	7	6	15	Male.
Do........	9.5	14	6	8.5	9.5	5.5	5	12	Do.

PAGURUS ALASKENSIS (Benedict).

Eupagurus bernhardus var. *B granulata-denticulata?* BRANDT, Middendorff's Sibir. Reise, Zool., 1851, p. 107.

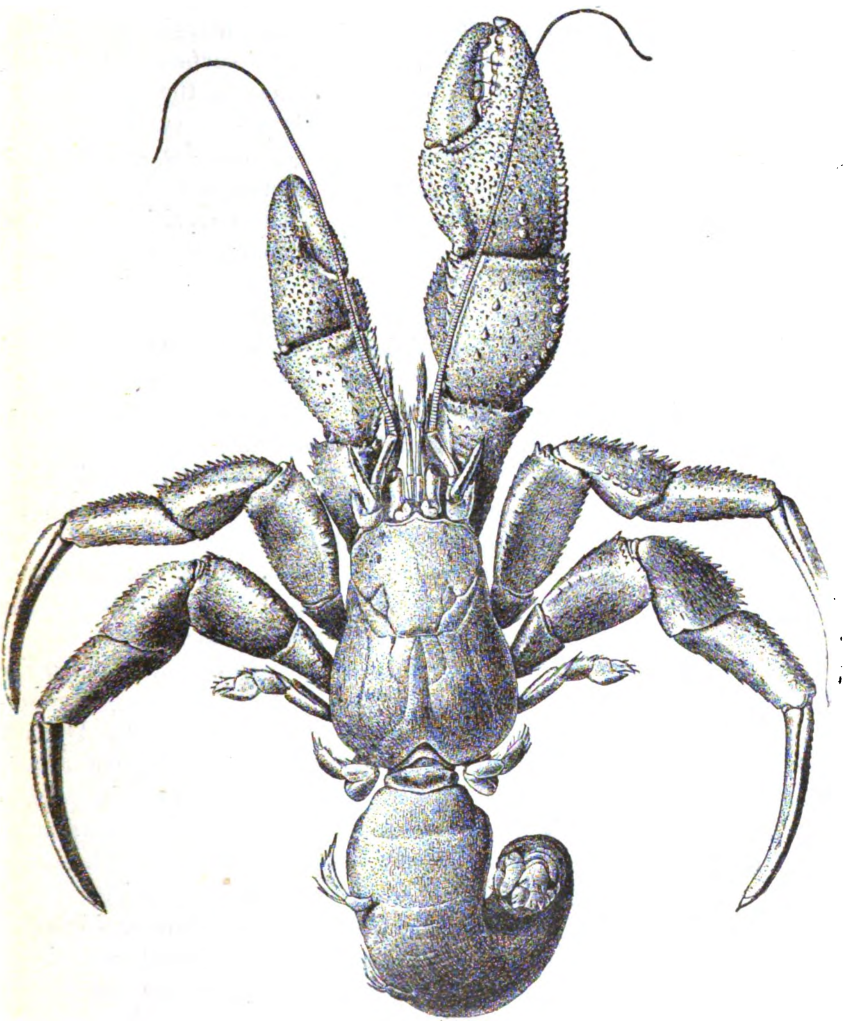
Eupagurus bernhardus STIMPSON, Boston Jour. Nat. Hist., VI, 1857, p. 483.

Eupagurus alaskensis BENEDICT, Proc. U. S. Nat. Mus., V, 1892, p. 2.

Pagurus alaskensis HOLMES, Occasional Papers Cali. Acad. Sci., VII, 1900, p. 135.

The anterior portion of the carapace is a little broader than long. The rostral tooth is produced to the base of the eye scales; the lateral projections are much less produced. The eyestalks are short and stout, constricted in the middle. The eye scales taper from the base to a blunt apex; the subterminal spine is conspicuous from above. The acicles of the antennæ reach the proximal end of the flagella and are three-sided; sides flat, iridescent. The inner margin is armed with from 12 to 16 short conical teeth, and is set with bunches of hair.

The merus of the right cheliped is very stout and strong, and extends beyond the eye by about one-half its length. The carpus is armed on its inner margin with a line of stout spines; there are also two longitudinal rows of spines on its upper surface; it is elsewhere thickly set with spiny granules. The hand is set with spiny granules forming a border on the outer margin. On the fingers the surface is very coarsely granular.



PAGURUS ALASKENSIS.

The left cheliped is much smaller than the right; its carpus has a row of strong spines on the inner margin, and a parallel row farther down on the outer surface; otherwise it is set with spiny granules as in the large hand. The dactyl does not show from above any flattened surface, but from the prehensile edge to the outer margin it is evenly rounded.

The ambulatory legs of the right side overreach the right cheliped but little; in very large specimens not at all. The upper surface of the merus joints are a little flattened. The upper margin of the carpus is armed with a single row of spines. Upper surface of propodal joints flattened, armed with a row of short spines on the summit and elsewhere with spiny granules. The dactyls are very wide, compressed, and twisted. The upper surface is convex, its summit and margins each set with a row of granules. Between these rows are long, smooth surfaces. The inner surface of the dactyl is flat. The outer surface is very convex near the proximal end, but becomes much more flattened near the tip.

In alcoholic specimens the general color above is a light purple with iridescent reflections; below, light, tinged with reddish. A red streak runs around the prehensile edge of the thumbs and behind the dactyls to the inner margins of the hands. There is an oblong patch of red on the outer distal margins and on the inner upper surface of the merus joints of the cheliped. The lower outer surface of the carpal joints of the ambulatory legs are pointed with red. The propodal joints and dactyls are longitudinally streaked with red.

This species is very close to *bernhardus*, but is easily distinguished by its broader and shorter left hand, by the wide dactyls of the ambulatory legs, by the acicula, and by its pearly iridescence.

Brandt recognized but one North Pacific "variety" of *bernhardus* besides the very distinct *ochotensis;* of this he had but a single specimen obtained by Wosnesenski at Unalaska and believed by Brandt to be identical with the very common form on the English coast, which he designates under the descriptive phrase as "var. *B. granulata-denticulata.*" As *alaskensis* has a much greater resemblance to the true *bernhardus* than has *aleuticus*, Brandt's descriptive phrase is made synonymous with it, though from the locality *aleuticus* would be much more likely to be obtained. Stimpson says under *Eupagurus bernhardus*,[1] "Specimens have been sent from Puget Sound by Dr. Kennerly." Specimens from the Straits of Fuca are small but readily distinguished from *acadianus*.

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[1] Ann. Lyc. Nat. Hist., New York, VII, p. 89.

RECORD OF SPECIMENS EXAMINED.

Alaska, from Unimak Island to Bristol Bay, 5 to 47 fathoms; U. S. Fish Commission steamer *Albatross*, 1890 and 1891:

Station.	Cat. No.	Station.	Cat. No.	Station.	Cat. No.	Station.	Cat. No.
3215	16353	3248	16363	3286	16374	3297	16385
3218	16392	3249	16364	3287	16375	3298	16386
3231	16354	3250	16365	3288	16376	3300	16387
3233	16355	3268	16366	3289	16377	3301	16388
3234	16356	3269	16367	3290	16378	3302	16389
3235	16357	3270	16368	3291	16379	3304	16390
3236	16358	3271	16369	3292	16380	3305	16391
3240	16359	3278	16370	3293	16381	3448	16784
3242	16360	3281	16371	3294	16382	3456	16785
3246	16361	3283	16372	3295	16383	3460	16786
3247	16362	3285	16373	3296	16384	3463	16787

From Gulf of Georgia, British Columbia, to Cape Flattery, Washington, 31 to 67 fathoms; U. S. Fish Commission steamer *Albatross*, 1888:

Station.	Cat. No.
2863	16406
2867	16393
2868	16352
2869	16408
2872	16351

Port Townsend, Washington; U. S. Fish Commission steamer *Albatross*, 1889 (16394).

Siberia and Alaska; W. H. Dall:

Locality.	Fathoms.	Bottom.	Cat. No.
Port Providence, Plover Bay	8–20	Mud	16395
Nazan Bay, Atka	10–16	Sand	16398
Port Möller	Beach to 17	do	16400
Chignik Bay	7–18	do	16402
Chirikoff Island	9–14	do	16397
Chajafka Cove, Kadiak	15–20	Gravel	12502
Port Mulgrave, Yakutat Bay	6–40		16396
Lituya Bay	6– 9	Sandy mud	16401

Killisnoo, Alaska; Lieut. Commander H. E. Nichols, U. S. N. (12407). Kasa-an Bay, Prince of Wales Island, Alaska; Dr. T. H. Streets, U. S. N. (16404). Victoria, British Columbia, 10 fathoms; Dr. C. F. Newcombe (15803).

Measurements of Pagurus alaskensis.

Locality.	Length of carapace.	Length of large hand.	Length of dactyl.	Width of hand.	Length of small hand.	Length of dactyl.	Width of small hand.	Right ambulatory leg. Length of dactyl.	Sex.
	mm.	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	
3248	19.5	43.5	22	24	29	18	15	35	Male.
	16	29	14	16	20.5	13	12	24	Female.
	15	27.5	13	16	20	11.5	11	23	Do.
3250	24	56	27	29	35.5	21	16.5	43	Male.
3294	19.5	39	19	21.5	28	17	14.5	34	Do.
	18.5	37	18	21	26.5	16.5	14.5	31	Do.
	15.5	30	14	16.5	22	14	11	27	Do.
	15	28	13	16	21	12.5	10	25	Do.
3246	22	52	26	27	33	20.5	16	39	Do.
	17.5	35	18	19	24	15.5	12	29	Do.
	16.5	30	15	17	22	14	11	27	Do.
	16.5	30.5	16.5	17.5	22	13	12.5	24.5	Female.
	18	31.5	16	17.5	23	13.5	12	25	Do.
3286	16	28.5	13	16.5	22	13	11.5	26	Male.
	15.5	30	14.5	17	21.5	13	11	25	Do.
	12	22	10.5	12	16	10	8.5	20	Do.
	12	20.5	9.5	11	15.5	9.5	8	18.5	Do.
	10	18	8.5	11	13	8	7	16	Do.
	10	16.5	8	9.5	13	7.5	7	15	Female.
	10.5	18	8.5	11	14	8	7.5	15	Male.
	9	17	8	9.5	12	7	6.5	14.5	Do.

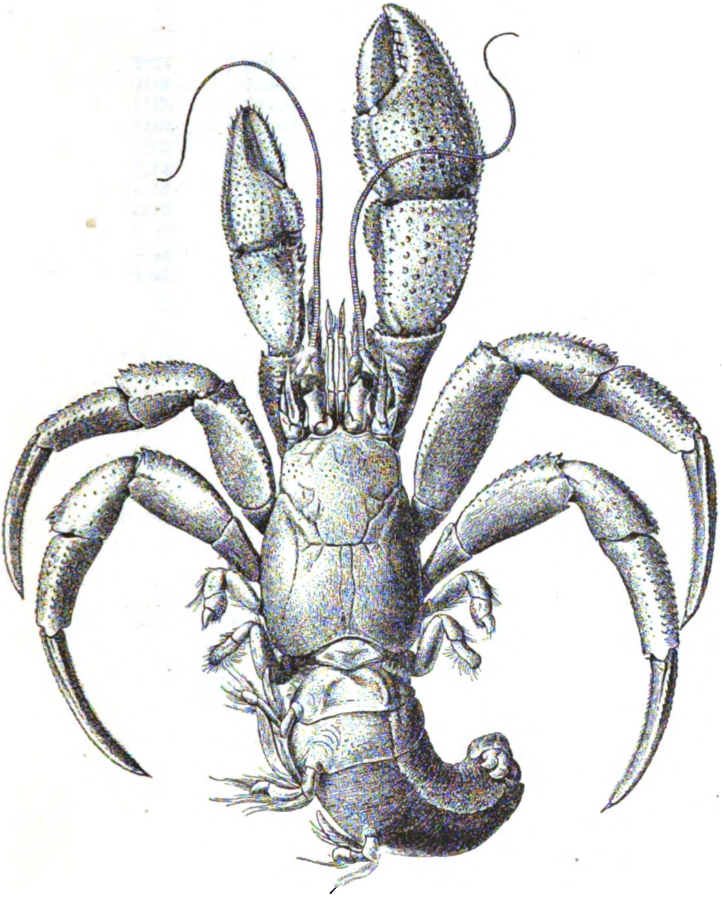
PAGURUS ALEUTICUS (Benedict).

? *Pagurus streblonyx* OWEN, Beechey's Voy., Zool., Crust., 1839, p. 81 (not Leach).
Eupagurus aleuticus BENEDICT, Proc. U. S. Nat. Mus., XV, 1892, p. 3.
Pagurus aleuticus HOLMES, Occasional Paper Cali. Acad. Sci., VII, 1900, p. 136.

The front has the three teeth sharper and a little more prominent than in *alaskensis.* The middle or rostral tooth is not quite so much produced. The eyestalks are much stouter and some longer than in *alaskensis.* The eye scales are larger and less acuminate. The subterminal spine does not show from above. The acicles are broader at the base than in *alaskensis.*

The chelipeds are stout. The carpal joints are armed with numerous sharp spines. That of the left cheliped is three-sided, and not four, as in *alaskensis.* The dactyls of both hands show from above a smooth oblique surface, either flat or a trifle concave. In the small hand this surface is free from hair and granules; in the large hand it is bordered with short spiny granules, and the granules inclosed are very small. The spiny granules of both hands are bifurcate, except those of the margin, which are simple. The dactyls of the ambulatory legs are very wide and thin. The upper surfaces are entirely occupied by a sulcus, deep at the base of the article, becoming shallow at the end. This character of the dactyls is sufficient to distinguish this from any other species of the *bernhardus* type. The color is dark in most specimens.

The dactyl of the large hand has a horny tip on the prehensile edge in old and young. In *alaskensis* this character is present in the young only, as is also true of *acadianus*.



PAGURUS ALEUTICUS.

Owen's remarks on the two specimens taken at Kamchatka will apply well enough to this species. The color is usually "a dirty brown hue, and the left hand is quite variable."

RECORD OF SPECIMENS EXAMINED.

From Unalaska to Oregon, 13 to 238 fathoms; U. S. Fish Commission steamer *Albatross*, 1888 to 1890.

Station.	Cat. No.	Station.	Cat. No.	Station.	Cat. No.
2844	16441	3216	16409	3282	16411
2847	16425	3217	16433	3310	16424
2848	16415	3224	16440	3311	16418
2849	16428	3225	16437	3313	16420
2852	16430	3257	16434	3321	16436
2854	16423	3258	16438	3322	16429
2855	16419	3259	16416	3334	16432
2856	16426	3260	16442	3335	16412
2862	16413	3267	16414	3453	16788
2866	16439	3273	16435	3458	16789
2882	16444	3278	16443	3460	16790
2884	16427	3279	16410		
3076	16421	3280	16431		

Alaska, from Unalaska to Cook Inlet; W. H. Dall.

Locality.	Fathoms.	Bottom.	Cat. No.
Captains Harbor, Unalaska	9–15	Gravel, stones	16405
Captains Harbor, Unalaska, between South Flat and West Head.	30	Sand	16780
Ridge, Captains Harbor	80	do	16781
Port Levasheff			12500
West of Amaknak Island	60	Rock, stones, mud	16399
Coal Harbor, Unga	8–9	Sand, stones	16407
Chiachi Islands	20	Mud	16779
Chajafka Cove, Kadiak	12–14	Mud, sand	16782
Kachekmak Bay, Cook Inlet	20–60	Sandy mud	12512

Measurements of Pagurus aleuticus.

Locality.	Length of carapace.	Length of large hand.	Length of dactyl.	Width of large hand.	Length of small hand.	Length of dactyl.	Width of small hand.	Right ambulatory leg. Length of dactyl.	Sex.
	mm.	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	
2845	23	54	21	24	33	20	15.5	42	Male.
	20	47	22.5	22.5	29.5	17.5	13.5	40	Do.
	20	35	16.5	19	25	15	13	33	Female.
	22.5	46	22	23	30	17.5	16.5	35	Male.
2856	20	41.5	20	22	27.5	16	13.5	33	Do.
2854	17	32	14.5	17	22	12.5	11.5	27.5	Do.
	18	32	14.5	17	22	12	11.5	28.5	Female.
	13	23	10.5	12	16	9.5	9	20	Male.
3259	18.5	39	18.5	21	24.5	14	13.5	30	Do.
	20	40	19	20.5	26	15.5	14.5	31	Do.
	16.5	30	13	16.5	20.5	11.5	11.5	27	Do.
	18	29	12.5	17	21	11.5	12	25.5	Female.
	14	25	10.5	14.5	17.5	9.5	10	21	Do.
3216	15.5	31	14	16.5	21	11.5	11	27.5	Male.
	13	23.5	11	13	16	9.5	9	21	Female.
	13	24.5	11.5	12	17	10	9	22	Male.
	12	22	10	11.5	15	9	8	21	Do.
	10.5	19	9	10	13	7.5	7	19	Female.
	12	20.5	10	11	14.5	8	8	20	Male.
	10	17.5	8	9.5	12.5	7	6	17.5	Do.
	10	16	8	9	12	7	6.5	16	Female.

Summary of tables of measurements.

Name.	Average length of carapace.	Average length of large hand.	Average length of dactyl of large hand.	Average width of large hand.	Average length of small hand.	Average length of dactyl of small hand.	Average width of small hand.	Length of dactyl of the right anterior ambulatory. leg.
	mm.	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*
Pagurus bernhardus.	12.3	22	11.5	11.1	14.7	9	6.7	19
Pagurus acadianus.	14	23.5	10.5	12	16	10	8	20.5
Pagurus alaskensis..	15	31	14	17.5	21.5	13	11	25.5
Pagurus aleuticus ..	16	30	14	16	20.7	12	11	26.5

PAGURUS OCHOTENSIS Brandt.

Pagurus (*Eupagurus*) *bernhardus* var. *C. spinimana;* or sp. *ochotensis* BRANDT, Middendorff's Sibir. Reise, Zool., 1851, p. 108.

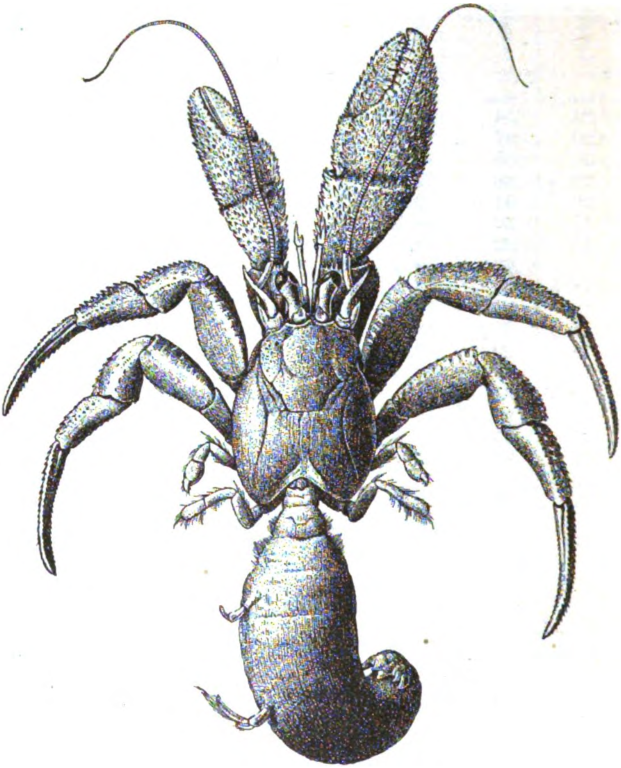
Bernhardus armatus DANA, U. S. Expl. Exped. Crust., I, 1852, p. 442, pl. XXVII, fig. 2.

Eupagurus armatus STIMPSON, Boston Jour. Nat. Hist., VI, 1857, p. 484.—BATE, Nat. in Brit. Columbia, II, 1866, p. 287.

Pagurus ochotensis HOLMES, Occasional papers, Cali. Acd. Sci., VII, 1900, p. 137.

The front is tridentate, the teeth of nearly equal prominence; the eyestalks are moderately large; the eye scales pointed, the subterminal spine showing from above. The antennal acicula is very large, flat, its inner edge hairy and very uneven, but not spiny as in *aleuticus* and *alaskensis*, the inner surface highly iridescent. The outer angle of the basal article is very much produced, and the inner edge is spiny.

Chelipeds not long, the merus extending but very little beyond the eyes. Where the preceding species of the *bernhardus* type are granular or with spiny granules, this species is thickly set with slender spines. The hands are hairy, the hairs not reaching to the end of the spines.



PAGURUS OCHOTENSIS.

The color of alcoholic specimens is a straw yellow. Slender streaks of red run longitudinally on the carpal, propodal, and dactyl joints of the ambulatory legs. The merus joints have two transverse streaks of the same color.

RECORD OF SPECIMENS EXAMINED.

From Vancouver Island to San Diego, California, 20 to 62 fathoms; U. S. Fish Commission steamer *Albatross*, 1888 and 1890.

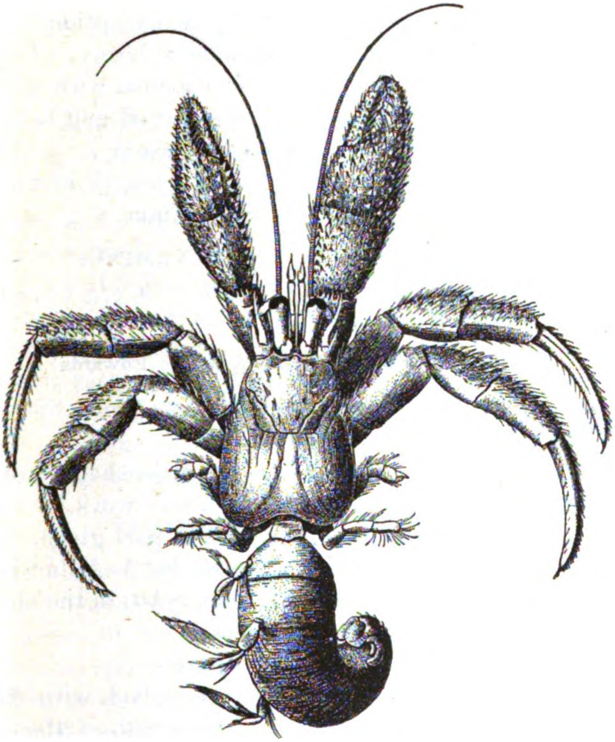
Station.	Cat. No.	Station.	Cat. No.
2879	16512	3111	16516
2880	16513	3146	16517
2881	16514	3150	16518
2934	16515	3154	16519

Alaska; W. H. Dall:
? Port Levasheff, 70 to 80 fathoms, mud, stones (16778).
Sitka, 10 to 25 fathoms (14951).
Menzies Bay, Discovery Passage, British Columbia, 6 fathoms, soft bottom; Lieut. Commander H. E. Nichols, U. S. N. (5929).
Victoria, British Columbia, 10 fathoms; Dr. C. F. Newcombe (15801).
Straits of Fuca (3397).

PAGURUS PATAGONIENSIS (Benedict).

Eupagurus patagoniensis BENEDICT, Proc. U. S. National Museum, XV, 1892, p. 3.

The anterior portion of the carapace is a little broader than long. The front has three rounded lobes equally produced. The lateral lobes are armed with a single small, sharp spine, which points directly forward. The length of the eyestalks laid off on the front equals the distance from the angle of the front to the middle of the eyestalk on the opposite side; they are stout, constricted in the middle, and dilated and flattened at the cornea. The eye scales are much as in *P. alaskensis;* the subterminal spine is black tipped and shows from above; the acicles reach the base of the flagella. In form they are very closely like that of *bernhardus*, and not so much flattened as in the related Alaskan species.



PAGURUS PATAGONIENSIS.

The chelipeds are a little shorter than the ambulatory legs of their respective sides. The carpus of the large cheliped is shaped like that of *P. bernhardus*, but it is evenly set with short, sharp spines with black, horny tips. The spines of the upper surface of the hand are like those of the carpus, and are arranged in seven more or less distinct rows. The hand is more than twice as long as broad; the outer margin is arcuate; the inner margin is nearly straight. The prehensile edges of the fingers are armed with large turbicles, and are horny near the tips.

The merus joints of both chelipeds are very smooth on their large surfaces, but bordered with spines below.

The left cheliped reaches to the base of the dactyl of the large hand. It is similar in shape and armature, with the exception of the prehensile edges of the fingers, which are much more horny. The carpus has an evenly convex outer and upper surface armed with spines.

The dactyls of the ambulatory legs are curved and bent, as in *bernhardus* and allied species, but are not compressed.

Length of the larger specimen 105 mm.; length of right cheliped 68 mm.; length of right ambulatory legs 85 mm.

RECORD OF SPECIMENS EXAMINED.

East coast of Patagonia, 43 fathoms, station 2768; U. S. Fish Commission steamer *Albatross*, 1888 (16772), two specimens.

PAGURUS BARBIGER (A. Milne-Edwards).

Bernhardus barbiger A. MILNE-EDWARDS, Crustacea, Mission Scientifique du Cap Horn, Paris, 1891, p. F'28, pl. III, fig. 1 a–e.

The description of *P. patagoniensis* was published before the U. S. National Museum received a copy of the above work, or a comparison would have been made and the differences in part given.

As the figures of *P. barbiger* were drawn by A. Milne-Edwards and agree very well with his descriptions, they must, in the absence of the type specimens, be assumed to be correct.

The main points of difference are as follows:

The front of *P. barbiger* is slightly three lobed, with the middle a little in advance of the lateral lobes. The length of the eyestalk laid off on the front equals it in length. The carpus of the right hand is nearly rectangular. The outline of the left hand is evenly arcuate on both sides. The figure of the second foot shows a broad dactyle, a very broad propodus arcuate beneath, the carpus is also broad, and both it and the propodus are armed with teeth or spines markedly different from those on the chelipeds. Notwithstanding these differences, it is not impossible that the species may prove to be identical, as the type and only specimen of *P. barbiger* is very much smaller than either specimen in this museum. The length of the right cheliped is given as 23 mm.

ON A NEW SPECIES OF SPINY-TAILED IGUANA FROM UTILLA ISLAND, HONDURAS.

By Leonhard Stejneger,
Curator, Division of Reptiles and Batrachians.

Some time ago Dr. J. E. Jarnigan, United States consul at the port of Utilla, sent to the National Zoological Park, in Washington, several specimens of an undescribed species of spiny-tailed Iguana. Two of these died recently, and the adult serves as the type of the following description.

Utilla is a small island, only 7 miles long, situated off the coast of Honduras, in the Caribbean Sea. It is located within the 100-fathom line surrounding the mainland.

I take great pleasure in dedicating this new species to Dr. Frank Baker, the distinguished superintendent of the National Zoological Park, it being, so far as I know, the first new species described from specimens having lived in the park.

CTENOSAURA BAKERI, new species.

Diagnosis.—A rather large dewlap hanging from the posterior part of the throat; caudal whorls of spines separated by one and two rows of scales; spines of median caudal crest subequal, much larger than the other caudal spines; upper side of tibia with somewhat enlarged keeled scales; dorsal crest high, composed of about 40 spines, not continuous with caudal crest.

Type.—No. 26317, U.S.N.M.

Habitat.—Utilla Island, Honduras.

Remarks.—The present species, in possessing a well-developed pendant dewlap, shows a close relationship to *Ctenosaura palearis*, described by me a few years ago, from Gualan, in Guatemala,[1] and because of this striking peculiarity needs no comparison with any other species of the genus. From *C. palearis* it differs chiefly in the less marked differentiation of the enlarged upper tibial scales and in the scutellation of the tail. In *C. bakeri* only the fourth to eighth caudal whorls are composed of two scale rings, the others of three, viz, the posterior spinous one and two smaller basal rings, while in *C. palearis* there is only one very small basal ring throughout. In the latter the median spine of this basal ring is also correspondingly small, so that the median caudal crest consists of alternate large and small spines, while in *C. bakeri* the spines of the crest are equal or nearly so. Moreover, in this species the lateral spines are much less developed, being, in fact, smaller than the median series, while the opposite is true of *C. palearis.* There are many more structural differences, notably the smaller size of the head scales of *C. bakeri*, but the characters pointed out above are sufficient to separate the two species. The coloration is also somewhat different, inasmuch as the lateral black bands, though in the specimens of *C. bakeri* before me rather obscure, nevertheless involve the dorsal crest, the spines of which at the crossing of the band are jet black, while in *C. palearis* the crest appears to be uniform pale.

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[1] Proc. U. S. Nat. Mus., XXI, 1899, p. 381.

The dewlap of *C. bakeri* is not quite as large as in *C. palearis.* The former species, therefore, in this, as in the scutellation of the tail, fills somewhat the gap between *C. palearis* and the other species of the genus, thus demonstrating the wisdom of not creating a new generic term based upon that character.

A NEW SYSTEMATIC NAME FOR THE YELLOW BOA OF JAMAICA.

By Leonhard Stejneger,
Curator, Division of Reptiles and Batrachians.

The yellow boa found in Jamaica is generally known as *Chilabothrus inornatus*, or *Epicrates inornatus*. The specific name, however, was given by the elder Reinhardt to the boa inhabiting Porto Rico, and as a direct comparison between a number of specimens from both islands has convinced me that they are specifically distinct, I am constrained to give the Jamaican boa a new name.

EPICRATES SUBFLAVUS, new species.

Diagnosis.—Scales 39–45 around the body; ventrals 274–286; no labial pits; a single frontal between supraoculars, which are nearly as large as frontal; prefrontals broadly in contact with preocular; color pale yellowish, with numerous blackish dorsal and lateral cross bars in zigzag, anteriorly quite broken and obscure, posteriorly strongly marked and extended so as to make the ground color appear blackish.

Type.—No. 14507, U.S.N.M.

Habitat.—Jamaica.

In the exclusion of the preocular from contact with the prefrontals by one or more smaller shields the Porto Rican boa differs constantly from the Jamaican species. The coloration is also quite different, and there are numerous other characters in the scutellation the constancy of which can only be demonstrated by a larger material than I have access to at present. The division of the nasal does not offer a good character, though in the Porto Rican form it appears to be oftener undivided than in Jamaican specimens, but the size and arrangement of the parietals seem to be fairly diagnostic, since in all the specimens and accurate figures of Jamaican specimens examined by me there are two pairs of regular parietals of subequal size, the one immediately behind the supraocular frequently being even larger than the median pair, while in the true *E. inornatus* from Porto Rico the median pair, if not entirely split up into small shields, is much larger than the one on each side behind the supraoculars.

There is also a slight, though apparently constant, difference in the number of ventrals, since in eight Jamaican specimens of *E. subflavus* I count, or find recorded, 274 to 286 ventrals, while the corresponding figures in eleven Porto Rican *E. inornatus* are 261 to 271.

DIAGNOSIS OF A NEW SPECIES OF IGUANOID LIZARD FROM GREEN CAY, BAHAMA ISLANDS.

By LEONHARD STEJNEGER,
Curator, Division of Reptiles and Batrachians.

Three species of *Leiocephalus* have thus far been recorded from the Bahamas, viz: *L. schreibersii*, *loxogrammus*, and *carinatus*. The first two belong to a group of the genus different from the one which includes the species here described. Whether the *L. carinatus* credited to the Bahamas is identical with the Cuban species or whether it agrees better with our new form I am unable to say, for lack of authentic material. A few specimens in the National Museum (No. 4846), collected by Dr. Bryant in the Bahamas, seem to be true *L. carinatus*, however.

LEIOCEPHALUS VIRESCENS, new species.

Diagnosis.—Ventral scales smooth; outer parietals twice as large as inner; head shields nearly smooth; three pairs of prefrontals; fifth toe, without claw, not more than half the length of head from tip of snout to posterior edge of parietals.

Type.—No. 26758, U.S.N.M.

Habitat.—Green Cay, Bahamas.

This new *Leiocephalus*, which was collected April 12, 1886, by the parties of the United States Fish Commission steamer *Albatross*, visiting Green Cay, belongs to the group of species typified by the Cuban *L. carinatus*. It differs materially from that species, however, in the shortness of its fifth toe, which is shorter than, or at most equals, half the length of the shielded part of the head, measured from the tip of the snout to the posterior border of the parietals. All the scales of the body are, moreover, larger and much more pointed. The caudal crest is particularly high and well developed. The coloration also seems to differ somewhat as, in addition to the dusky dorsal cross bars, there is a light dorso-lateral line from the supraoculars to the base of the tail, and a similar but broader one from the temples to the groin, with a broad dusky band between them.

Twelve additional specimens testify to the constancy of the characters displayed by the type.

ON THE WHEATEARS (SAXICOLA) OCCURRING IN NORTH AMERICA.

By LEONHARD STEJNEGER,

Curator, Division of Reptiles and Batrachians.

Among the Passerine birds there is scarcely a genus more characteristic of the Old World than *Saxicola*, forming, as it does, a very compact and well-circumscribed group of about forty species inhabiting Africa, Asia, and Europe, None of its near relatives, such as *Pratincola*, *Ruticilla*, *Cyanecula*, *Luscinia*, etc., inhabit any part of the New World. The Wheatears and their allies are consequently quite foreign to the Nearctic fauna.

The occurrence of the common European Wheatear (*Saxicola œnanthe*) in North America, at first thought to be only occasional or accidental, but since ascertained to be that of a regular breeder, has therefore always excited interest from a zoo-geographical standpoint, especially as it was found that, although a typical migratory bird and breeding both at the northeastern and the northwestern extremity of our continent, it appeared as a regular migrant nowhere in North America, the few isolated specimens recorded from Maine, Long Island, and even Bermuda being easily recognized as stragglers.

Once it was understood that the Wheatear was not a mere casual visitor, but a legitimate native of our continent, ornithologists naturally were on the lookout for differential characters by which to separate the American birds specifically; and Cassin, who was apparently the first to handle a specimen from eastern North America, clearly pointed out its distinctions and figured the specimen. Not unnaturally, at that time (1854) he concluded that his Nova Scotia[1] specimen and the one from northwestern America, which Vigors many years previously had named *Saxicola œnanthoides*, were identical, both being from America, and he accordingly gave his bird this name, notwithstanding the fact that his own bird was characterized by its great size, while Vigors's measurements showed a very small specimen.

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[1] According to Brewer, in the History of North American Birds, I, p. 60, this specimen came in reality from Coal Harbor, Labrador. The gentleman who collected it was from Nova Scotia.

This large race was clearly understood by Professor Baird when, in 1864, he wrote his admirable Review of American Birds, but though he speaks of these large specimens as having "reached North America by the Greenland route," it almost seems as if he regarded the few obtained in Labrador and Canada as winter migrants returning regularly to Greenland to breed, though he indicates the possibility that they might "nest in Newfoundland and Labrador."

Shortly after, Mr. W. H. Dall discovered the species breeding in Alaska, but these birds failed to bear out the characters of the alleged American race, which then fell into innocuous desuetude, so far as American ornithologists were concerned. The last one to examine into the matter was Mr. W. E. Nelson, who says[1] that:

> The specimens secured by Mr. Dall were transmitted to Mr. Tristram to be compared with European specimens, with the result of determining that birds secured in Lapland at the same season were identical with the Alaskan examples. I have made a hasty comparison of my skins with those in the National Museum from Greenland and several Old World localities, and find no differences other than individual.

The fact that large and small specimens were found both in Europe and in America seemed to close the incident forever. It appeared settled that *Saxicola œnanthe* was a homogeneous species, and consequently there was at that time no real objection to the conclusion that the Alaskan birds possibly returned to their winter quarters in Africa by way of Greenland. No attention was then paid to the suggestion made by me in my Results of Ornithological Explorations in the Commander Islands and in Kamchatka (1885) (pp. 349–351), that the *Saxicola œnanthe* breeding in the Tchuktchi Peninsula and Alaska migrate southwestward along the Stanovoi Mountains to Udski, and thence farther through the interior of Asia. I did not elaborate the route of the *Saxicola* then, partly because the material at hand was as yet insufficient, partly because it was not one of the species collected by me in Kamchatka.

The existence in Europe of a large form had long been suspected. Thus Degland as early as 1849[2] noted the existence of the large race, as follows:

> I have obtained at Dunkerque, in the month of May, specimens which are much larger than those which breed on our plains [Lille], and which differ, moreover, in their coloration. Their tarsus is longer, while their body nearly equals that of *Saxicola leucura;* the upper surface is less gray, tinged with reddish; the underside of a beautiful rufous, especially on the breast, neck, and sides, and the wing feathers are of a less deep black.

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[1] Report on Natural History Collections made in Alaska, 1887, p. 221.

[2] Ornith. Europ., I, p. 484.

It seems that Gould in his "Birds of Great Britain" also noted this difference, but it was not till 1879 that Lord Clifton in more express terms called attention to the two races, without naming them, however. His remarks[1] are so much to the point that I take pleasure in quoting them in full:

> The only authorities that I have been able to discover on the subject are Gould and Schlegel,[2] other authors having failed to recognize any variation in the individuals of *Saxicola œnanthe* as generally recognized. Of these two authors Gould is the only one who gives exact measurements of the large race. I therefore quote the following from his "Birds of Great Britain:"
>
> | | Length. | Spread of wing. | Wing. |
> |---|---|---|---|
> | | *Inches.* | *Inches.* | *Inches.* |
> | Large race............ | 6¼ | 11⅝ | 4 |
> | Small race............ | 5¾ | 10¼ | 3¼ |
>
> Without giving his other measurements these will be enough to show the proportions of the two forms. As regards the difference in colouring, that is easily stated. Both races assume in spring a grey back, a white forehead and eye streak, and a darker wing; but while the smaller race changes from a reddish buff on the lower surface to pale yellow buff on the throat and breast, and whitish on the abdomen, the larger race retains the deep reddish buff on the throat and breast, and if there is any difference between the autumn and spring colouring of these parts it is that there is a richer glow of red about them in spring than in autumn.
>
> It is clear, therefore, that, independently of size, the rich reddish throat of the larger bird distinguishes it at once from the paler bird.
>
> It remains to say what little I know of the separate range and migration of this larger race. It is soon told. I know nothing of the bird's occurrence west of Sussex; but it certainly appears every May on the shores of Sussex and Kent, and also on the opposite shores of the continent (see Schlegel's "Birds of Europe"). Schlegel[3] says it appears "in the month of May." Gould obtained two specimens from Dungeness on May 9. My brother, Mr. Ivo Bligh, shot one in Cobham Park, near Gravesend, on May 1. This last specimen agrees exactly in size and color with Gould's life-size figure, and also with specimens at Swaysland's, the Brighton bird preserver.
>
> On the whole, therefore, I am unable to see why such a distinctly large race, that retains a red breast in summer and arrives on our southeast coast in May instead of March, should not be as worthy of recognition as the large brightly coloured bullfinch of eastern Europe.

Unfortunately, as has already been remarked, Lord Clifton omitted to name the bird so well characterized by him, the inevitable result being that his successors simply ignored the existense of this large bird, or only gave it a passing notice, as Seebohm[4] and Saunders.[5]

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[1] Ibis, 1879, pp. 256–257.

[2] A mistake for Degland, as I believe.—L. S.

[3] As already stated, I believe this to be a confusion with Degland's Ornithologie Européenne. Schlegel, to my knowledge, has published no Birds of Europe, nor does he say anything of a large race of Wheatear in his Revue (1844) or his Vogels van Nederland (1860).—L. S.

[4] Hist. Brit. Birds and Eggs, I, 1883, p. 303.

[5] Ill. Man. Brit. Birds, 1889, p. 20.

Had the bird been named, no doubt there would have been a more eager controversy and we should sooner have had the necessary material and records to solve the question.

Lately, however, the subject has received new impetus by the observation of Mr. Knud Andersen on the two races in the Fær Islands[1] and those of Mr. Herluf Winge on the large race in Greenland.[2] Professor Collett's detailed measurements of large series of the typical bird have also been very useful in this connection.

Finally, the United States National Museum has of late years acquired a fairly good series of both forms, for the use of which and other help I wish to express my grateful acknowledgment to Mr. Robert Ridgway, the curator, and Dr. C. W. Richmond, the assistant curator.

SAXICOLA ŒNANTHE LEUCORHOA (Gmelin).

Diagnosis.—Larger than *Saxicola œnanthe*, the length of wing varying between 100 and 108 millimeters; color similar, but the rufous tints more bright on the average.

Habitat.—Breeding in Greenland and opposite portions of North America, as well as on Iceland, migrating regularly via the Fær Islands, Shetlands, Great Britain, and France, probably to western Africa, and straggling south to the northern United States and Bermudas.

Remarks.—The accompanying diagram (p. 481) and tables clearly sustain the claims of this form to subspecific distinction. Add to these data those furnished by Mr. H. Winge, viz, 60 Danish birds with wings measuring from 91 to 99 mm. and 18 Greenland birds from 100 to 106 mm., and it will be seen that out of a total of 122 typical *Saxicola œnanthe* only 5 have the wing 100 or 101 mm., while of 45 *Saxicola leucorhoa* none measure less than 100 mm. In other words, only 4 per cent of the small race exceed 99 mm., while none of the larger are below 100. In the whole series of 165 birds, consequently, only 3 per cent of the specimens are intermediate. This is shown graphically in the diagram, which is based only upon the data specified below, as Mr. Winge has not given any detailed list of his specimens. The precentage of intergradation is therefore greater than it would have been could all the 165 specimens been tabulated. It will be seen that the average length of wing in typical *Saxicola œnanthe* is 94.5 mm. and of *S. leucorhoa* 104 mm.

It will be noticed that the list does not include a couple of measurements of female Wheatears from West Greenland recorded by Dr. O. Finsch[3] as having the wings from 3 inches 6½ lines to 3 inches 8 lines

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[1] Vid. Meddel. Naturhist. Foren. Copenh. 1898, p. 391.

[2] Grønl. Fugle, 1898, p. 284.

[3] Abh. Ver. Naturw. Bremen, V, 1877, p. 352.

(pied du Roi), but the reason why I have ventured to ignore them in the face of the above series of 45 birds is that Dr. Finsch himself says that the wing feathers of some of the specimens were very worn.[1]

A look at the table of measurement also shows that the Alaskan specimens belong to the smaller, typical bird. We have, consequently, in America both forms, *Saxicola œnanthe* in Alaska and *Saxicola leucorhoa* in Greenland and adjacent parts of northeastern North America. As all the birds found in the latter part of the continent belong to the large race, it is settled beyond the shadow of a doubt that the Wheatears which breed in Alaska do not migrate by way of Greenland or Labrador, but that they retrace their steps into the Tchuktchi Peninsula and farther south into Asia, as indicated by me fifteen years ago.

The Wheatear, the most widely distributed species of the genus *Saxicola*, thus extends its range across the entire palæarctic continent from the Atlantic to the Pacific Ocean. At both extremities of its home continent, however, it has expanded its range into the New World, and no one who follows on the map the route of the retreating winter migrants can for a moment be in doubt that these routes really represent the way by which the species originally invaded America. It would be difficult to find a more beautiful example to illustrate that now well-known law which was first formulated by Prof. Johan Axel Palmén, of Helsingfors. Moreover, no better example could be found for demonstrating the necessity of minute discrimination in ascertaining the characters by which these "migration route races," as Palmén calls them, are characterized.

It seems that one more lesson can fairly be drawn from the differentiation of the Greenland race, viz, that the Greenland-Iceland-England route must be considerably older than the Alaska-Tchuktchi-Udski route, since it has resulted in the establishment of a separable race. A consideration of the further fact that no regular migration route could have been effected between Greenland, Iceland, and Great Britain during the present distribution of land and water in that part of the world also leads us back to a period when the stretches of ocean now separating those islands were more or less bridged over by land. For such a condition of affairs we shall have to look toward the beginning of the glacial period. At that time it must, therefore, be assumed that the Wheatear extended its range into Greenland. The advent of the typical form into Alaska, on the other hand, is probably one of very recent time, an assumption corroborated by the somewhat uncertain and erratic distribution of the species in that northwestern corner of our continent.

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[1] "Namentlich sind die Spitzen und Aussensäume der Schwingen und Schwanzfedern sehr abgenutzt."

A few remarks regarding the name here employed for the large race may not be out of place.

Gmelin's *Motacilla leucorhoa* was based upon a specimen from Senegal, described by Buffon[1] and figured in the Planches Enluminées.[2] So far as the diagnosis goes[3] it fits our bird exactly, and all reasonable doubt is dispelled by the dimensions of a Senegal specimen in the Paris Museum, possibly the type itself, measured by Hartlaub[4] who gives 105 mm. (3 inches 10½ lines, pied du roi) as the length of the wing. It should be noted that Hartlaub also records the typical *Saxicola œnanthe* from Senegal (specimen in the Leyden Museum, wing 95 mm., 3½ inches, pied du Roi). Hartlaub, however, seems to regard the larger bird as a peculiar west African species and not as a large migratory race of the common species. The possibility of this view being correct is the only consideration which prevents us from positively asserting that the large race which breeds in Greenland passes the winter in Senegal.

Bechstein's *Motacilla œnanthe major*[5] refers probably only to large individuals of the common form.

For the sake of convenience I append lists of the more noteworthy references to both forms.

SAXICOLA ŒNANTHE (Linnæus).

1758. *Motacilla œnanthe* LINNÆUS, Syst. Nat., 10th ed., I, p. 186 (Europe); 12th ed., I, 1766, p. 332.—*Saxicola œnanthe* BECHSTEIN, Ornith. Taschenb., 1803, p. 217.—HARTLAUB, Syst. Ornith. Westafr., 1857, p. 64 (Senegal).—DALL and BANNISTER, Trans. Chicago Acad., I, 1869, p. 276 (Nulato, Alaska).—TRISTRAM, Ibis, 1871, p. 231 (Alaska; Lapland).—COLLETT, Nyt. Mag. Naturvid., XXIII, 1877, p. 103; XXVI, 1881, p. 269; XXXV, 1893, p. 13 (Norway).—NELSON, Cruise *Corwin*, 1881, 1883, p. 59 (St. Michaels, King Island, Alaska); Rep. Nat. Hist. Coll. Alaska, 1887, p. 221 (Alaska).—BEAN, Proc. U. S. Nat. Mus., V, 1882, p. 146 (Cape Lisburne, Port Clarence, Clamisso Il., Alaska).—SEEBOHM Hist. Brit. B. Eggs, I, 1883, p. 301 (Great Britain).—STEJNEGER, Res. Ornith. Explor. Comm. Ils. Kamtsch., 1885, p. 349 (Tchuktchi Penins.; migration).—MURDOCH, Rep. Intern. Polar Exp. Point Barrow, 1885, p. 104 (Point Barrow, Alaska).—BUNGE, Beitr. Kenntn. Russ. Reich. (3), I, 1885, p. ——.—PALMÉN, Vega-exp. Vet. Iakt., V, 1887, p. 260 (Pitlekaj, Jinretlen, Tchuktchi Penins.).—TURNER, Contr. Nat. Hist. Alaska, 1888, p. 196.—SAUNDERS, Ill. Man. Brit. B., 1889, p. 20 (Great Britain).—BISHOP, North Am. Fauna, No. 19, 1900, p. 96 (Circle; mouth of Aphoon, Yukon R., Alaska).

1839. *Saxicola œnanthoides* VIGORS, Zool. *Blossom* (p. 19), (northwest America).

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[1] Hist. Nat. Ois., quarto ed., V, 1788, p. 249.

[2] Plate 583, fig. 2.

[3] "Un peu plus grand que le motteux de nos contrées, & ressemble très-exactment à la femelle de cet oiseau, en se figurant néanmoins la teinte du dos un peu plus brune, & celle de la poitrine un peu plus rougeâtre."

[4] Syst. Ornith. Westafr., 1857, p. 64.

[5] Naturg. Deutschl., IV, 1795, (p. 646.)

SAXICOLA ŒNANTHE LEUCORHOA (Gmelin).

1780. *Motacilla œnanthe* Fabricius, Fauna Grœnl., p. 122 (Greenland), (not of Linnæus).—Mohr, Isl. Naturhist., 1786, p. 52 (Iceland).—*Saxicola œnanthe* Faber, Prodr. Isl. Ornith., 1822, p. 18 (Iceland).—Holboell, Naturhist. Tidsskr., IV, 1843 (p. 392), (Greenland).—Krueper, Naumannia, 1857, pt. 2, p. 25 (Iceland).—Jones, Nat. Bermuda, 1859 (p. 28), (Bermuda).—Coues, Proc. Phila. Acad., 1861, p. 218 (Labrador).—Reinhardt, Ibis, 1861, p. 5 (Greenland).—Newton, in Baring-Gould's Iceland, 1863, p. 409.—Baird, Rev. N. Am. Birds, 1864, p. 61 (Greenland, Canada).—Baird, Brewer, and Ridgway, Hist. N. Am. Birds, I, 1874, p. 60.—Newton, Arct. Man., 1875, p. 98 (Greenland).—Finsch, Zweite Deutsche Nordpolarf., II, 1874, p. 183 (Shannon I., East Greenland); Abhandl. Ver. Nat. Bremen, 1874, p. 104; 1877, p. 352 (West Greenland).—Feilden, Ibis, 1877, p. 403 (Fort Foulke).—Kumlien, Bull. U. S. Nat. Mus., No. 15, 1879, p. 73 (Cumberland Sound; Disco Isl., Greenland).—Clifton, Ibis, 1879, p. 256 (England).—Merriam, Auk, 1884, pp. 295, 378; 1885, pp. 113, 305 (Godbout, Quebec, Canada).—Allen, Auk, 1886, p. 490 (Long Island, New York).—Grœndal, Ornis, 1886, pp. 357, 609 (Iceland).—Fischer and Pelzeln, Mitth. Ornith. Ver. Wien, X, 1886, p. 195 (Jan Mayen I.); Zoologist, 1890, p. 8.—Kohn, Auk, 1888, p. 76 (New Orleans, Louisiana, accid.).—Greeley, Rep. Proceed. U. S. Exp. Lady Franklin Bay, II, 1888, p. 27 (Smith Sound).—Hagerup, Auk, 1889, p. 297 (Ivigtut, Greenland).—Comeau, Auk, 1890, p. 294 (Godbout, Canada).—Stone, Proc. Phila. Acad., 1892, p. 152 (Disco, W. Greenland).—Dutcher, Auk, 1893, p. 277 (Long Island, New York).—Andersen, Vid. Med. Naturh. Foren. Copenhag., 1898, p. 391 (Fær Ils.).—Winge, Grœnlands Fugle, 1898, p. 284 (Greenland).

1788. *Motacilla leucorhoa* Gmelin, Syst. Nat., I, pt. 2, p. 966 (Senegal).—*Œnanthe leucorhoa* Vieillot, Nouv. Dict. d'Hist. Nat., XXI, 1818, p. 428 (Senegal).—*Saxicola leucorhoa* Hartlaub, Syst. Ornith. Westafr., 1857, p. 64 (Senegal).

1831. *Saxicola leucothoa* Lesson, Traité d'Orn., I, p. 413 (err.; based on Gmelin).

1854. *Saxicola leucorrhoa* Hartlaub, Journ. f. Orn., 1854, p. 19 (based on Gmelin).

1854. *Saxicola œnanthoides* Cassin, Illustr. Birds, Cal., Tex., etc., I, p. 208, pl. xxxiv ("Nova Scotia," corr. Labrador), (not of Vigors).—Gaillard, Contr. Faune Ornith. Europ. Occ., Pt. xxix, 1891, p. 85 (Greenland, Labrador).

1889. ? *Saxicola isabellina* Meade-Waldo, Ibis, 1889, p. 515 (Canary Ils.; not of Rüppell).

Measurements of wing of 62 specimens of Saxicola œnanthe.

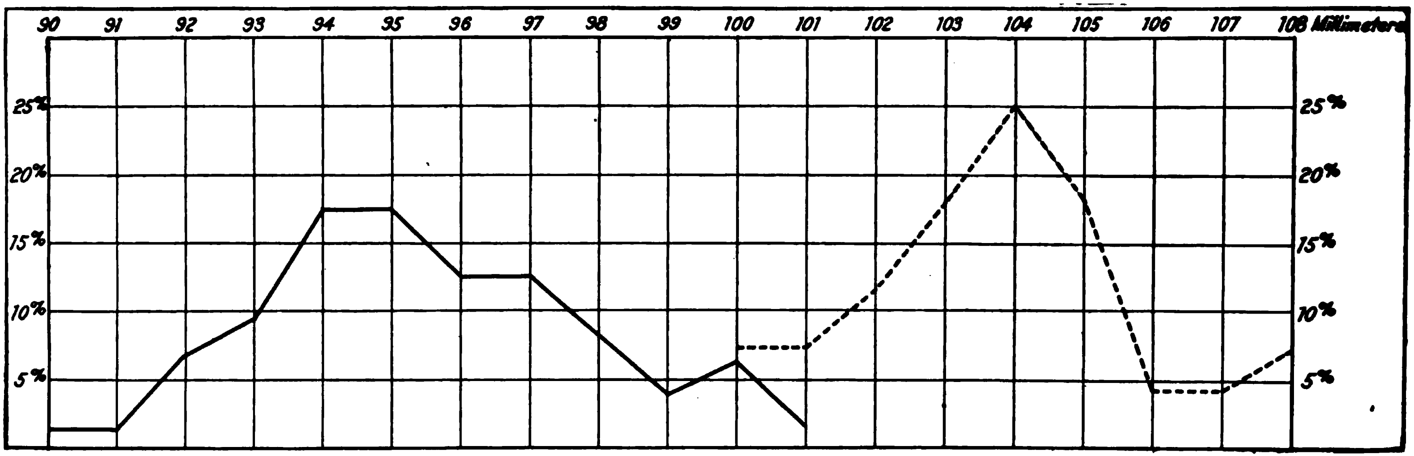
U.S.N.M. No.	Sex.	Locality.	When collected.	From whom received or by whom recorded.	Length of wing.
					mm.
152814	Male	Helsuan, Egypt	Mar. 14, 1894	A. Fényes	95
116471	do	Germab-Geok-tepé, Transcaspia	Mar. 6, 1886	Tiflis Nat. Hist. Mus	98
69971	do	Rostock, Germany		S. Burchard	94
111122	do	Kristiania, Norway	May 9, 1884	R. Collett	98
111123	Female	Lindesnæs, Norway	Apr. 27, 1886	do	93
24061	Male	North Germany	May 20,		94
115619	Female	Florence, Italy	Aug. —, 1884	H. H. Giglioli	92
18957	Male	France		H. Drouet	96
102881	do	Havre, France	May 18, 1873	V. Plûche	92
102882	do	do	Aug. 22, 1873	do	95
102883	do	do	Sept. 4, 1873	do	100
102888	do	Lancing, Sussex, England	Apr. 22, 1884	H. Swaysland	94
102890	Female	do	May 4, 1884	do	90
102891	Male	do	July 28, 1884	do	94
102892	do	do	Apr. —, 1883	do	95
106351	do	do	Mar. 26, 1884	do	92
106352	Female	do	Apr. 4, 1884	do	93
106350	Male	Romney, England	Sept. 4, 1883		96
105360	do	Haskim, England	Apr. 10, 1878	H. K. Coale	94
113824	do	Devon, England	Apr. 17, 1876	R. P. Nicholls	94

Measurements of wing of 62 specimens of Saxicola œnanthe—Continued.

U.S.N.M. No.	Sex.	Locality.	When collected.	From whom received or by whom recorded.	Length of wing.
					mm.
113826	Male	Thurston Sands, England	May 1, 1877	R. P. Nicholls	98
	do	Nolsœ, Fær Islands	May 2, 1895	Andersen, p. 392	96
	do	do	do	do	94
	Female	do	do	do	97
	do	do	July 28, 1896	do	98
	Male	Drammen, Norway	Aug. 11, 1878	Collett, 1881, p. 269	97
	Female	W. Aker, Norway	Oct. 27, 1877	do	99
	Male	do	May 29, 1883	Collett, 1893, p. 14	96
	do	do	May 4, 1884	do	96
	do	Lindesnæs, Norway	Apr. 2, 1886	do	95
	do	Homborgsund, Norway	do	do	97
	do	Lindesnæs, Norway	May 6, 1886	do	96
	Female	W. Aker, Norway	May 4, 1884	do	94
	do	Lindesnæs, Norway	Apr. 27, 1886	do	94
	Male	Kristiania, Norway	May 8, 1871	Collett, 1877, p. 103	100
	do	Bodœ, Norway	June 7, 1874	do	97
	do	Kristiania, Norway	May 7, 1876	do	95
	do	do	Sept. 23, 1876	do	96
	Female	do	May 8, 1871	do	95
	do	Gudbrandsdal, Norway	May 28, 1874	do	92
	do	Kristiania, Norway	May 19, 1876	do	93
	do	do		do	93
	Male	Senegal, Africa		Hartlaub, 1857, p. 64	95
81337	do	Cape Lisburne, Alaska	Aug. 21, 1880	T. H. Bean	96
81336		do	do	do	101
106065		do	Aug. 21, 1885	H. D. de Woolfe	95
106064		do	May —, 1885	do	93
81335		Chamisso Island, Alaska	Aug. 31, 1880	T. H. Bean	95
81338	Male	Port Clarence Alaska	Sept. 6, 1880	do	100
54385	Female	Nulato, Alaska	May 23, 1868	W. H. Dall	94
54437	Male	do	do	do	100
88745	do	Point Barrow, Alaska	May 20, 1882	J. Murdoch	98
88740	do	do	May 19, 1882	do	97
88741	Female	do		do	92
81303		St. Michael, Alaska		E. W. Nelson	98
81302		do		do	97
54409	Male	Nulato, Alaska	May —, 1868	W. H. Dall	99
	do	Pitlekaj, Tchuktchi Peninsula	June 1	Palmén, p. 261	91
	Female	do	June 9	do	98
	Male	Jinretlen, Tchuktchi Peninsula	June 8	do	95
	Female	do	May 5	do	97
	do	do	June 2	do	94

Measurements of wing of 28 specimens of Saxicola œnanthe leucorhoa.

U.S.N.M. No.	Sex.	Locality.	When collected.	From whom received or by whom recorded.	Length of wing.
					mm.
		Senegal, Africa		Hartlaub, 1857, p. 64	105
161909	Male	Hurbert Island	Aug. 25, 1897	J. D. Figgins	104
161910	?	do	do	do	100
161911	Female	Barden B	Aug. 26, 1897	do	103
161912	Male	do	do	do	105
135063	do	Ann Arbor, Mich.?		A. B. Covert	103
18075		Grosvater Bay, Labrador	Aug. 24, 1860	E. Coues	104
23246		Quebec, Canada		W. Couper	104
20551		Godthaab, West Greenland		Williams' College Lyceum.	104
76063	Male	Disco Island, West Greenland	Aug. 10	L. Kumlien	100
151544		Jakobshavn, West Greenland		P. H. Sörensen	105
56496	Female	Iceland		W. Schlueter	101
		do		Winge, 1898, p. 288	104
	Male	Disco, West Greenland	Aug. 11	Stone, 1892, p. 152	106
	Female	Shannon Island, East Greenland	May 13, 1870	Finsch, 1874, p. 184	104
		do	July 26, 1870	do	106
		do	do	do	108
	Male	Lichtfels, West Greenland	Aug. 28	Finsch, 1874, p. 104	104
		do	July 12	do	102
		Greenland		Finsch, 1877, p. 352	105
	Male	Nolsœ, Fær Islands	May —, 1895	Andersen, 1898, p. 392	102
		do	Sept. 10, 1895	do	101
	Male	do	Sept. 26, 1895	do	102.5
	do	do	July 3, 1897	do	105
102886	do	Lancing, Sussex, England	May 2, 1884	H. Swaysland	107
102887	do	do	do	do	102
102885	Female	Surrey, England	May 18, 1874	do	103
113825	do	Kingsbridge, England	Oct. 3, 1887	R. P. Nicholls	103



LENGTH OF WING EXPRESSED IN PERCENTAGE OF TOTAL NUMBER OF SPECIMENS.

—— Sixty-one specimens of typical *Saxicola œnanthe* from Europe, northeastern Asia, and Alaska.

- - - - Twenty-eight specimens of *Saxicola œnanthe leucorhoa* from northeastern America, Greenland, and western Europe.

LIST OF FISHES COLLECTED IN THE RIVER PEI-HO, AT TIEN-TSIN, CHINA, BY NOAH FIELDS DRAKE, WITH DESCRIPTIONS OF SEVEN NEW SPECIES.

By James Francis Abbott.

The fishes comprising the collection described in the following paper were obtained from the Pei-Ho River in 1898 by Dr. Noah Fields Drake, professor of geology in the Imperial University of Tien-Tsin, China, and by him presented to the zoological museum of the Leland Stanford Junior University. Specimens of the new species described in this paper have been deposited in the U. S. National Museum. The writer is indebted to the courtesy of President David Starr Jordan and Prof. Charles Henry Gilbert, of Stanford University, for the privilege of working over the collection. He is also indebted to Mr. Kinichiro Mayeda for material assistance.

The following species are described as new:

1. *Toxabramis argentifer.*
2. *Culticula emmelas.*
3. *Pseudogobio drakei.*
4. *Leuciscus sciistius.*
5. *Parapelecus machærius.*
6. *Culter tientsinensis.*
7. *Salanx hyalocranius.*

FAMILY SILURIDÆ.

PARASILURUS ASOTUS (Linnæus).

Four specimens, length: 270, 280, 255, and 110 mm. The band of vomerine teeth continuous in the larger specimens, interrupted in the smaller one.

PSEUDOBAGRUS VACHELLII (Richardson).

Seventeen young specimens, average l. 85 mm. Maxillary barbel does not reach end of head. Occipital process very narrow.

FAMILY CYPRINIDÆ.

CARASSIUS AURATUS (Linnæus).

Eighteen specimens, l. 80 mm. to 160 mm. D. III, 16–17. A. III, 5–6. Head, 3¼; depth, 2⅓.

CYPRINUS CARPIO (Linnæus).

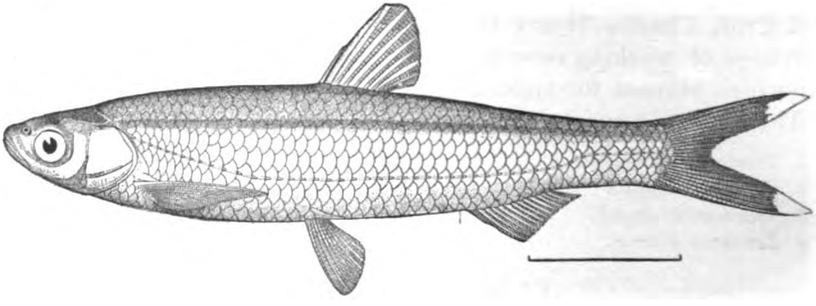
Six specimens, l. 70 mm. to 145 mm.

ACHEILOGNATHUS IMBERBIS Günther.

Sixteen specimens, average l. 82 mm. D. II, 13. A. II, 10.[1] Scales, 4–35–6. Pharyngeal teeth serrate; no barbels. There is quite a prominent anal papilla, lying between the ventrals and usually equaling them in length.

TOXABRAMIS[2] ARGENTIFER Abbott, new species.

This genus apparently closely resembles the two genera *Hemiculterella*, Warpachowski,[3] and *Hemiculter*, Bleeker,[4] but in the latter the pharyngeal teeth are in three series, and in the former there is no thickened second dorsal spine and the abdomen is not trenchant anteriorly. However, many of the numerous genera in this family appear to rest upon very weak foundations, and it is likely that a comparative and critical study of the material that recent years have afforded will reduce the number recognized.



TOXABRAMIS ARGENTIFER, NEW SPECIES.

Description.—Head, 4⅔ in length to base of caudal; depth 4½, eye 4 in head. (D. II, 7.) (A. I, 13.) Scales 8–44–3. Pharyngeal teeth hooked at tip, 5.3–3.4. Body elongate, dorsal outline straight. Head triangular, snout moderate, 4 in head. Mouth terminal, small and narrow, the lower jaw slightly projecting. Maxillary reaching to vertical from nostrils. Lateral line sharply decurved above pectorals.

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[1] See Bleeker, Memoir sur les Cyprinoïdes de Chine, Amsterdam Academy, 1871.

[2] [Type, *Toxabramis swinhonis* Günther; Ann. and Mag. Nat. History 1873, p. 249.]

[3] Bull. Acad. Sci. St. Petersbourg XXXII, p. 23.

[4] Cyprinoïdes de Chine.

rising again abruptly at end of anal to middle of caudal peduncle. Dorsal nearer tip of snout than root of caudal by a distance equal to diameter of eye, arising almost even with ventrals; second spine rather stout, weakly serrated. Origin of anal a trifle beyond perpendicular from tip of dorsal. Pectoral equal to head in length, not reaching ventral. Color silvery, darker above. Length 130 mm.

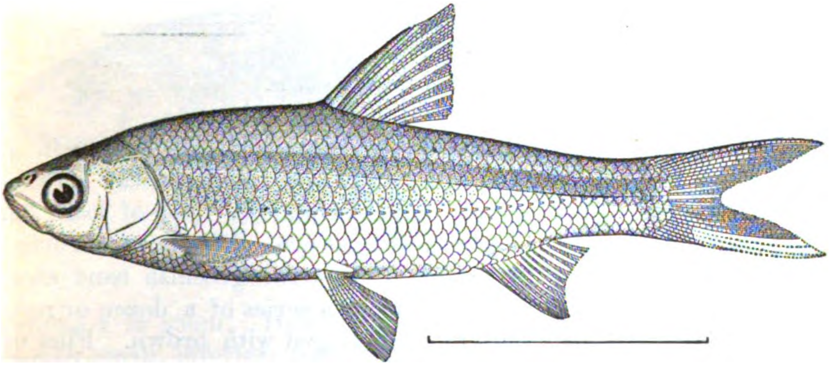
Type.—No. 6299 in Leland Stanford Junior University Museum; also No. 49545, U. S. N. M.

CULTICULA Abbott, new genus.

Distinguished by the following set of characters: Teeth in one row, 6 or 5–5, knife-shaped, not hooked. Abdomen keeled between ventrals and anal, the scales not running across. Dorsal inserted a little behind ventrals, with 7 branched rays, preceded by 2 spines, the second of which is strong and smooth. Anal inserted below tip of depressed dorsal; rays II, 11. Lateral line complete; curved downward; extending along middle of caudal peduncle. Scales large, 47 in lateral series; 8 between lateral line and dorsal fin. Air-bladder large, with median constriction. Alimentary canal long; folded many times. Peritoneum black. Sides with a straight, dark, lateral band equal in width to diameter of eye.

CULTICULA EMMELAS Abbott, new species.

Dorsal, II, 7. Anal, II, 11. Scales, 8½–47–4½. Body elongate elliptical, both outlines equally curved. Depth 4 in body length to base of caudal. Head 4⅖ in body, acute, the eye median, anterior, 4 in head, about equal to snout. Interorbital a little more than one-third the length of the head. Mouth terminal, lips thin. Pharyngeal teeth, knife shaped, not hooked, 6 or 5–5. Pectoral rather short, about a pupil's length shorter than head. Ventrals inserted under dorsal, the latter inserted nearer tip of snout than root of caudal by distance equal to snout. Lateral line arises at upper limit of opercle



CULTICULA EMMELAS, NEW SPECIES.

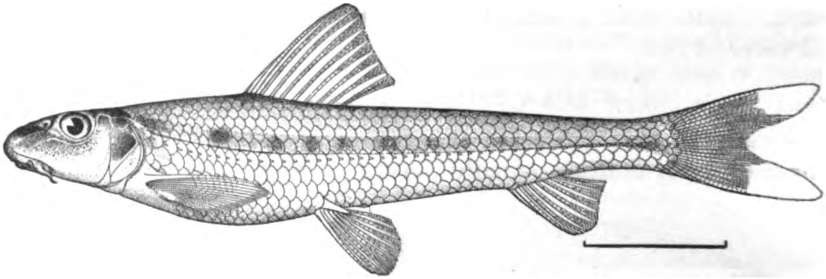
and descends rather abruptly to below middle of body, rising again to middle of caudal peduncle. Abdomen keeled between ventrals and anal, the scales not running across. Anal inserted below tip of dorsal. Caudal deeply forked. Color uniform yellowish brown, silvery, with a pale greenish longitudinal stripe the width of the eye, above the middle of body. Fins pale. Length 70 mm.

Type.—No. 6295 in Leland Stanford Junior University Museum; also No. 49546, U. S. N. M. Three cotypes (No. 6296) average about 90 mm. in length.

PSEUDOGOBIO DRAKEI Abbott, new species.

This species is closely related to *P. esocinus* (Schlegel), from which it differs in the shorter snout and smaller scales. From *P. sinensis* it is easily separated by the much more anterior position of the dorsal.

D. II, 9; the first spine very short. A. 8. Scales 7–46–6. Pharyngeal teeth 5–5, sharply hooked. Body rounded and elongate, depth 5⅓ in body length. Head 5 in length. Snout rather elongate, but not greatly produced with reference to the position of the eye as in *P. esocinus;* 2⅓ in head. Eye 4⅓ in head, placed about midway between extremities of snout and opercle. Interorbital 3½. Top of head flat, snout obtusely rounded. Barbel as long as eye. Distance from origin of dorsal to tip of snout, 2⅔ in body. A narrow greenish band along sides, just above lateral line, in which is a series of a dozen or more darker spots. Top and sides of head tinged with brown. Fins unspotted. Length, 140 mm.



PSEUDOGOBIO DRAKEI, NEW SPECIES.

Type.—No. 6303 in Leland Stanford Junior University Museum; also No. 49547, U. S. N. M. Twelve cotypes (No. 6304) average in length 90 mm.–110 mm.

PSEUDOGOBIO SINENSIS (Kner).

Four specimens, two about 85 mm. long and two very young. Five stripes across tail, four across dorsal.

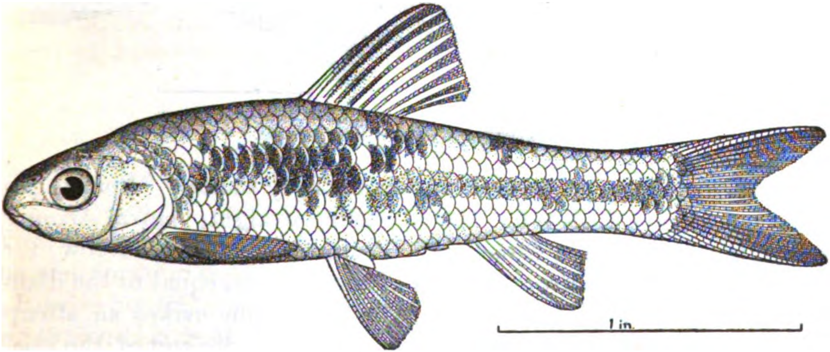
HEMIBARBUS BARBUS (Schlegel).

Four specimens, l. 140, 160, 180, and 300 mm. This is evidently the *Barbus schlegelii* of Günther,[1] though differing slightly from his and Schlegel's descriptions. Dorsal III, 7, the first spine minute. Anal 8. The Tien-Tsin specimens differ markedly from the descriptions in coloration. The ground tint is (in alcohol) a pale pinkish yellow, thickly and irregularly sprinkled above and on sides with small brown dots. A series of larger spots about the size of the pupil runs along the side just above the lateral line. A similar series on back. Dorsal and caudal spotted. Other fins pale. We have accepted Günther's conclusions regarding Schlegel's statements concerning the pharyngeal teeth. These are in three series in the Pei-Ho specimens.

LEUCISCUS SCIISTIUS Abbott, new species.

This species appears to resemble *Gobio nigripinnis* and *Gobio nitens* of Günther.[2] All three species appear to be separated from other Leuciscids by the short few rayed anal and single tooth in the inner series of pharyngeal teeth, but the material is too scanty to afford any very definite data.

Dorsal 10, anal 8, scales 4½–38–3½. Depth 4½, head 4, caudal peduncle width 9 in body. Snout 3⅓, eye 4, interorbital 3⅓ in head. Preorbital 2 in snout. Head blunt and rounded, dorsal out parabolic; mouth small, inferior; maxillary protractile; barbels none. Pharyngeal teeth 5.1–1.5, hooked at tip.



LEUCISCUS SCIISTIUS, NEW SPECIES.

Origin of dorsal nearer tip of snout than root of caudal by distance equal to that between lateral line and first dorsal ray. Pectorals about 4⅓ in body. Ventrals inserted under posterior half of dorsal and not quite extending to anal. An anal papilla is present.

Color light yellowish brown with or without irregular groups of dots or blotches of dark brown, especially along lateral line; dorsal dark. Length 67 mm.

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[1] Catalogue VII, p. 135.

[2] Ann. and Mag. of Nat. Hist., 1873, p. 246.

Type.—No. 6301 in Leland Stanford Junior University Museum. Two cotypes (No. 3202) about same length; one of these is numbered 49548, U. S. N. M.

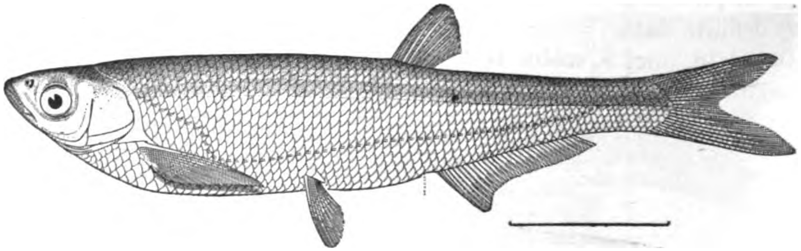
ELOPICHTHYS BAMBUSA (Richardson).

One specimen, l. 180 mm. D. 11; A. 12. Ventral I, 9. Lateral line 96. Maxillary extending to below orbit. Caudal very deeply forked. The post-ventral portion of the abdomen is not compressed. Height of dorsal five-sixths of depth of body. Pharyngeal teeth 4.4.1–2.4.4.

PARAPELECUS MACHÆRIUS Abbott, new species.

Very close to *Parapelecus argenteus* Günther,[1] differing especially in the pharyngeal dentition and the longer anal and pectoral fins.

D. 10; A. 29. Lateral line 68. Depth $4\frac{1}{3}$, head $5\frac{1}{6}$; eye $3\frac{3}{4}$ in head. Head and body very strongly compressed. Snout very acute. Maxillary reaching level of nostril, mouth strongly slanted. Pharyngeal teeth hooked; 4. 4. 2.–2. 4. 4. Dorsal outline straight, ventral strongly arched, the whole edge trenchant. Pectorals long and narrow, terminating at a distance from the root of the ventrals, equal to the diameter of the eye; longer than head. The lateral line makes an abrupt descent at about the eighth pore, rising again at the end of the anal, to the middle of the tail, the anterior mucus tubes with a vertical branch as described for *P. argenteus.* Dorsal short, beginning midway between root of caudal and end of opercle, its last ray on the verticle from first ray of anal. Ventrals somewhat nearer to snout than to root of caudal. Color silvery, darker above. Length 130 mm.



PARAPELECUS MACHÆRIUS, NEW SPECIES.

Type.—No. 6307 in Leland Stanford Junior University Museum; also No. 49549, U.S.N.M.

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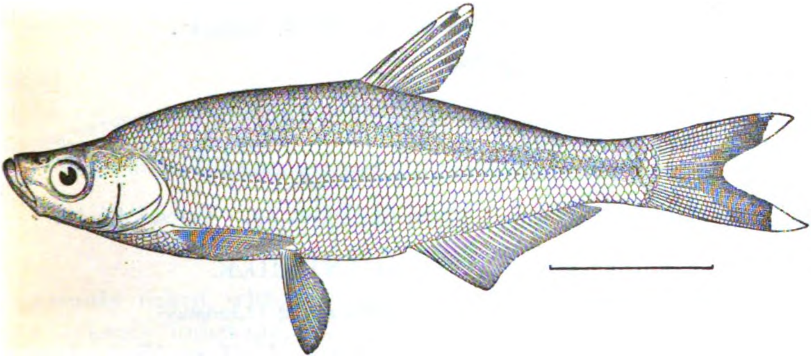
[1] Ann. and Mag. of Nat. Hist., 1889, p. 227.

CULTER TIENTSINENSIS Abbott, new species.

Very closely allied to *Culter brevicauda*, Günther, from which it differs in pharyngeal dentition.

Dorsal II, 7. Anal 28; head 4, depth 3½ in body; eye 4 in head, somewhat shorter than snout, a very little greater than interorbital. Maxillary equal to snout, 3½ in head, not quite reaching to verticle from anterior margin of eye; mouth with a strongly verticle slant. Preorbital broad, 2 in eye. Pharyngeal teeth rather small, 4. 3. 1.–1. 3. 4. Gill rakers fine and close set, one-half of eye in length. Top of head flat. Dorsal outline strongly arched, giving the fish a sort of humpbacked appearance. Lateral line 60, almost straight without downward curvature. Dorsal nearer root of tail than tip of snout by about the length of the eye; second spine, stout, smooth, 1⅝ in head. Pectoral 1¼ in head, reaching to ventrals. Abdomen trenchant from anus forward to insertion of pectorals. Coloration pale, a bluish stripe following the outline of the back about midway between lateral line and dorsal margin. Top of head dark. Length 120 mm.



CULTER TIENTSINENSIS, NEW SPECIES.

Type.—No. 6297 in Leland Stanford Junior University Museum; also No. 49550, U.S.N.M.

MISGURNUS ANGUILLICAUDATUS (Cantor).

Four adults, l. 200–250 mm., and 63 smaller specimens, av. l. 100 mm.

D. 8 or 9. A. 7. V. 6.

A very common fish in the stagnant waters of Japan and China. It has the remarkable habit of leaving the water and coming ashore in search of food, especially after a rain. Kept in a damp place it will live two or three days out of its element. The number of the black spots appears to vary considerably with the nature of the environment, and this is especially noticeable in the young stages.

FAMILY ENGRAULIDIDÆ.

COILIA NASUS Schlegel.

Sixteen specimens, 50 mm. to 140 in length. The length of the premaxillary, as Kner observes,[1] appears to be too variable to be of taxonomic importance. In the smaller specimens it usually does not extend to the limit of the opercle, but in the larger ones it frequently exceeds it.

FAMILY HEMIRAMPHIDÆ.

HEMIRAMPHUS INTERMEDIUS (Cantor).

Four specimens, l. 130 to 160 mm.

FAMILY TETRAODONTIDÆ.

LAGOCEPHALUS OCELLATUS (Osbeck).

Two specimens, l. 75 mm.

FAMILY OPHIOCEPHALIDÆ.

OPHIOCEPHALUS ARGUS Cantor.

Two specimens, l. 85 mm. Head 3⅙, snout 5½. Dorsal 47–48.

FAMILY POLYACANTHIDÆ.

POLYACANTHUS OPERCULARIS (Linnæus).

Three specimens, length about 40 mm. Uniform dusty brown, darker above with a dark spot on opercle.

FAMILY SALANGIDÆ.

SALANX HYALOCRANIUS Abbott, new species.

This species, which is represented by a great number of specimens, appears to be clearly distinct from *Salanx chinensis* Osbeck or *Salanx reevesii* Cuvier and Valenciennes, which is apparently the same. It is separated from both by the constantly greater number of both dorsal and anal rays. In *S. hyalocranius* both ventral and dorsal are more anterior than in *S. chinensis*, the dorsal in the latter lying above the anal, while in *S. hyalocranius* it is in advance of that fin. In the species at hand the distance from snout to ventrals is about 2⅗ of body length, while in Steindachner's figure of *S. chinensis*[2] it is about 2⅙.

In the account of *S. reevesii*, the dorsal base is said to lie its own length in advance of anal.

Description.—In *Salanx microdon*, as in *S. chinensis*, the number of pectoral rays is about 16. The teeth in *S. microdon* are even smaller than in *S. chinensis*.

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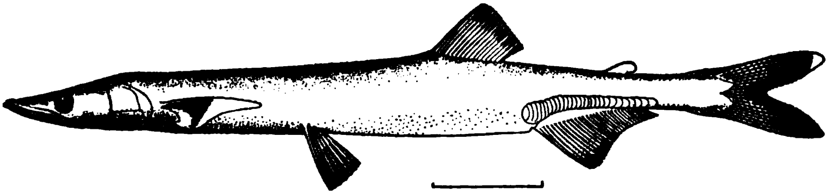
[1] Novara Fische, p. 335.

[2] Ichthy. Notizen.

Dorsal 16. Anal 30. Head 4⅓; depth (at anal) 2¼ in head. Snout 2⅗; eye 6 in head. Depth of head about 2 in its greatest breadth, which latter is equal to the distance from tip of snout to center of pupil. Interorbital 3¼ in head. Mouth large and broad, the lower jaw projecting. Teeth in both jaws rather moderate in size, larger at symphysis, strongly recurved, none of the teeth piercing the upper jaw. Tongue toothed. Skull hyaline, all the details of the brain showing clearly even in alcoholic specimens. Pectorals with 27 or more rays, the base of the fin fleshy. Ventrals inserted 2⅖ of body length from snout. Anal large and prominent, its base about 1⅕ of the length of head, two-thirds of head in height. Caudal peduncle slender, caudal deeply forked. End of dorsal base on the verticle from first ray of anal about 1⅔ of head in length, its longest ray 1⅓ of head. Adipose fin very small, placed above end of anal. Body apparently naked, with the exception of a single row of about 25 large, closely imbricate, and deeply embedded scales running just above anal on either side of the body. Body colorless. Caudal fin washed with dark brown. Length 145 mm.



SALANX HYALOCRANIUS, NEW SPECIES.

Type.—No. 6305 in Leland Standford Junior University Museum.

In a large number of cotypes (No. 6306), ranging from very young to 180 mm., the dorsal runs to 17 and occasionally to 18, and the anal varies from 28 to 31; also No. 49551, U.S.N.M.

This species is probably identical with *Eperlanus chinensis* Basilewsky, from Pekin, but the name *chinensis* is already used for the "Whitebait of Macao." Specimens of this species have also been received by Mr. Otaki from a stream in Korea.

FAMILY GOBIIDÆ.

GOBIUS GIURIS Buchanan-Hamilton.

Fourteen specimens; average length 40 mm.

KEY TO THE ISOPODS OF THE ATLANTIC COAST OF NORTH AMERICA WITH DESCRIPTIONS OF NEW AND LITTLE KNOWN SPECIES.

By Harriet Richardson,
Collaborator, Division of Marine Invertebrates.

American naturalists have added much to our knowledge of the Atlantic coast isopoda.

In 1818 Thomas Say published An Account of the Crustacea of the United States, which was the first attempt to contribute to the knowledge of the fauna of North America. In 1853 a number of new species from Grand Manan were described by William Stimpson. A report on the invertebrate animals of Vineyard Sound, by A. E. Verrell and S. I. Smith, followed in 1874, and in 1880 Oscar Harger's valuable work on the Isopoda of Vineyard Sound and Adjacent Waters was published.

In addition to the work done by American naturalists, about this time the Danish naturalists Schiœdte and Meinert, in their monograph of the *Cymothoidæ*, published descriptions and figures of a number of new species from the West Indies. A few years later (1887) H. J. Hansen gave an account of the fauna of Greenland, and in 1890 the same author greatly increased the number of known species of isopoda from the West Indies.

More recently Adrien Dollfus (1896) reported on some new West Indian *Armadillididæ*, and Ives in 1894 described some new species from Yucatan and Vera Cruz.

Norman and Stebbing and others to be mentioned later have likewise contributed to a knowledge of the North American fauna.

The aim of the present paper is to give a complete list of all the described species of isopoda on the Atlantic coast of North America, including Greenland and the West Indies.

In preparing the synopses of the families and genera, definitions and keys from many authors have been used, those of greatest value having been taken from the published works of Sars, Stebbing, Norman and Stebbing, Hansen, Schiœdte and Meinert, and Budde-Lund.

Some of the species herein described appeared in the diagnosis by the author of North American Isopoda.[1]

The present paper is based on material contained in the U. S. National Museum.

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[1] American Naturalist, XXXIV, 1900, pp. 207–230, 295–309.

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ANALYTICAL KEY TO THE TRIBES OR SUPERFAMILIES OF ATLANTIC COAST ISOPODA.[1]

a. Legs of first pair cheliform. Uropoda terminal. Pleopoda, when distinctly developed, exclusively natatory .. I. CHELIFERA or TANAIOIDEA (p. 500).

a'. Legs of first pair not cheliform.

- *b*. Uropoda lateral.
  - *c*. Uropoda forming together with the terminal segment of the abdomen a caudal fan. Pleopoda for the most part natatory. II. FLABELLIFERA or CYMOTHOIDEA (p. 505).
  - *c'*. Uropoda valve-like, inflexed, arching over the pleopoda, which to a great extent are branchial............ III. VALVIFERA or IDOTEOIDEA (p. 537).
- *b'*. Uropoda terminal.
  - *c*. Free forms.
    - *d*. Pleopoda exclusively branchial, generally covered by a thin opercular plate (the modified first pair).......... IV. ASELLOTA or ASELLOIDEA (p. 550).
    - *d'*. Pleopoda fitted for air-breathing .... V. ONISCOIDEA (p. 560).
  - *c'*. Parasitic forms.................... VI. EPICARIDEA or BOPYROIDEA (p. 576).

I. CHELIFERA or TANAIOIDEA.

ANALYTICAL KEY TO THE FAMILIES OF CHELIFERA.

a. Body scarcely attenuated behind. Mandibles without palp. Superior antennæ with one multiarticulate flagellum. Anterior maxillæ with only a single masticatory lobe and a one-jointed palp; posterior ones quite rudimentary. Second pair of legs ambulatory in character. Epignath of maxillipeds narrow, falciform .... Family I. TANAIDÆ (p. 500).

a'. Body narrow, produced, depressed. Mandibles with a three-jointed palp. Superior antennæ with two multiarticulate flagella. Anterior maxillæ with two masticatory lobes and a two-jointed palp; posterior ones well developed and setose. Second pair of legs with a large, broad, flat hand. Epignath of maxillipeds large, laminar, branchial in character. Family II. APSEUDIDÆ (p. 504).

Family I. TANAIDÆ.

ANALYTICAL KEY TO THE GENERA OF TANAIDÆ.

a. Pleopoda only three pairs, which are densely setose. Uropoda simple, short, single-branched. Eyes present.......................... 1. *Tanais*.

a'. Pleopoda five pairs. Uropoda double-branched.

- *b*. Eyes wanting.
  - *c*. Inner branch of uropoda 2–3 jointed. Pleopoda in female very small, or rudimentary.
    - *d*. Incubatory pouch formed only by two lamellæ issuing from bases of fourth pair of legs. Pleopoda in female rudimentary. Gnathopods alike in both sexes. Mandibles well developed, with cutting edge coarsely dentated. 2. *Cryptocope*.
    - *d'*. Incubatory pouch normal. Pleopoda in female small, sometimes wanting. Gnathopods in female of normal appearance, hand dilated, fingers strong, thumb serrulated; in male slender, fingers simple. Mandibles very small and feeble in structure, with cutting edge narrow....... 3. *Leptognathia*.
  - *c'*. Inner branch of uropoda 8–9 jointed. Pleopoda well developed. 4. *Alaotanais*.

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[1] Sars's analytic key has been used with slight modifications. Sars's An Account of the Crustacea of Norway, II. Isopoda (1896), Pts. I, II, p. 3.

b′. Eyes present.

c. Gnathopods in male imperfectly chelate, without any finger, or with finger very short and immovable .... 5. *Heterotanais*.

c′. Gnathopods in male with chelæ fully developed.

d. Gnathopods in male sometimes very much elongated, with carpus attenuated, hand very large, oblong, finger elongate and curved, immovable, strongly tuberculate within. Thoracic appendages not specialized into an anterior and a posterior series. Marsupium of female formed of eight large lamellæ from the first four free segments .... 6. *Leptochelia*.

d′. Gnathopods in male with chelæ very stout, the distal section of the penultimate joint extremely broad, with a toothed margin. Thoracic appendages specialized into an anterior and a posterior series. Marsupium of female of the normal structure .... 7. *Neotanais*.

1. TANAIS Audouin and Milne-Edwards.

ANALYTICAL KEY TO THE SPECIES OF TANAIS.

a. Abdomen composed of six distinct segments. Sixth segment terminated posteriorly by a blunt median projection. Without transverse setiferous bands crossing first and second abdominal segments. Body robust and tapering. Uropoda four jointed .... 1. *Tanais robustus* Moore.

a′. Abdomen composed of five segments. Sixth segment without blunt median projection, rounded. With transverse setiferous bands crossing first and second abdominal segments. Body slender, elongated. Uropoda three jointed. 2. *Tanais cavolinii* Milne-Edwards.

1. TANAIS ROBUSTUS Moore.

Tanais robustus MOORE, Proc. Acad. Nat. Sci. Phila., 1894, p. 90.

Habitat.—New Jersey.

2. TANAIS CAVOLINII Milne-Edwards.

Tanais cavolinii MILNE-EDWARDS, in Audouin and Milne-Edwards, Précis d'Entomologie, I, 1828, pl. XXIX, fig. 1; Hist. Nat. des Crust., III, 1840, p. 141, pl. XXXI, fig. 6.

Tanais tomentosus KRØYER, Naturhist. Tidssk., IV, 1842, p. 183; (2) II, 1847, p. 412; Voy. en Scand., Crust., 1849, pl. XXVII, figs. 2 a-q.—LILLJEBORG, Öfvers. Vet. Akad. Förh., Årg., VIII, 1851, p. 23; MEINERT, Crust. Isop. Amph. Dec. Daniæ, 1877, p. 86.

Crossurus vittatus RATHKE, Fauna Norwegens, 1843, p. 39, pl. I, figs. 1-7.

Tanais hirticaudatus BATE, Rep. Brit. Assoc., 1860, p. 224, 1861.

Tanais vittatus LILLJEBORG, Bidrag Känn. Crust. Tanaid., 1865, p. 29.—BATE and WESTWOOD, Brit. Sess. Crust., II., 1866, p. 125.—STEBBING, Trans. Devon. Assoc., 1874, p. 7; 1879, p. 6; Ann. Mag. Nat. Hist. (4), XVII, 1876, p. 78.—VERRILL, Am. Jour. Sci., X, 1875, p. 38.—HARGER, Proc. U. S. Nat. Mus., II, 1879, p. 162; Report U. S. Fish Com., 1880, Pt. 6, pp. 418, 419, pl. XIII, figs. 81-82.

Tanais tomentosus G. O. SARS, Crust. of Norway, II, Pt. 1, 1896, p. 12, pl. V.

Tanais cavolinii DOLLFUS, Bull. Soc. Zool. de France, XXI, 1897, p. 207; Mém. de la Soc. Zool. de France, XI, 1898, p. 35.—NORMAN, Ann. Mag. Nat. Hist., (7) II, 1899, pp. 332, 333. (See Norman for synonymy.)

Habitat.—Noank, Connecticut; Long Island Sound; Greenland; also west coast of Norway; British Isles; West France; Azores; Mediterranean.

2. CRYPTOCOPE Sars.

3. CRYPTOCOPE ARCTICA Hansen.

Cryptocope arctica Hansen, Vidensk. Meddel. fra den Naturh. Foren. i Kjöbh., 1887, p. 180, pl. VII, fig. 1–1c.

Habitat.—Greenland; Kara Sea.

3. LEPTOGNATHIA G. O. Sars.

ANALYTICAL KEY TO THE SPECIES OF LEPTOGNATHIA.

a. In female inner branch of uropoda twice as long as outer. The second or first free segment of thorax about two-thirds as long as the third, which in turn is about equal to the fourth and fifth. Sixth and seventh segments progressively somewhat shorter. Propodus of first pair of legs less robust than carpus .... 4. *Leptognathia cœca* (Harger).

a′. In female inner branch of uropoda more than three times as long as outer. The second or first free segment of thorax about same size as the last one, both being shorter than the others. Propodus of the first pair of legs scarcely smaller than carpus .... 5. *Leptognathia longiremis* (Lilljeborg).

4. LEPTOGNATHIA CŒCA (Harger).

Paratanais cœca Harger, Am. Jour. Sci., XV, 1878, p. 378.

Leptochelia cœca Harger, Proc. U. S. Nat. Mus., II, 1879, p. 164; Report U. S. Commissioner of Fish and Fisheries, 1880, Pt. 6, pp. 427, 428, pl. XIII, fig. 91.

Leptognathia cœca Norman and Stebbing, Trans. Zool. Soc. Lond., XII, 1886, Pt. 4, p. 110.

Habitat.—Massachusetts Bay, off Salem, Provincetown, Massachusetts.

Depth.—Surface to 48 fathoms.

5. LEPTOGNATHIA LONGIREMIS (Lilljeborg).

Tanais longiremis Lilljeborg, Bidrag till Kännedomen om de inom Sverige och Norrige förekommende Crustaceen af Isopodernas Underordning och Tanaidernas Familj, Upsala Univ. Arsskr., Math. og Naturv., I, 1865, p. 23.

Tanais islandicus G. O. Sars, Archiv for Math. og Naturvid., Christiania, 1876, p. 346.

Leptognathia longiremis G. O. Sars, Archiv for Math. og Naturvid., 1880, p. 41; Norwegian North Atlantic Expedition, 1876–1878, Crustacea, I, 1885; II, 1886, p. 79, pl. VII, figs. 17–28; Account of Crust. of Norway, II, 1896–1899, p. 27, pl. XII.—Hansen, Dijmphna-Togtots zoologisk-botanske Udbytte, 1886, p. 185; Vidensk. Meddel. fra den Naturh. Foren. i Kjobh., 1887, p. 179, pl. VI, figs. 9–9b. (See Hansen for synonymy.)

Habitat.—Greenland (Hansen); also Scotland (Scott); Norway; Iceland; Denmark.

Depth.—35 to 40 fathoms.

4. ALAOTANAIS Norman and Stebbing.

6. ALAOTANAIS HASTIGER Norman and Stebbing.

Alaotanais hastiger Norman and Stebbing, Trans. Zool. Soc. Lond., XII, 1886, Pt. 4, pp. 113, 114, pl. XXIII, fig. 2.

Habitat.—Lat. 59° 11′ N., long. 50° 25′ W.

Depth.—1,750 fathoms.

5. HETEROTANAIS G. O. Sars.

7. HETEROTANAIS LIMICOLA (Harger).

Paratanais limicola HARGER, Am. Jour. Sci., XV, 1878, p. 378.

Leptochelia limicola HARGER, Proc. U. S. Nat. Mus., II, 1879, p. 163; Report U. S. Commissioner of Fish and Fisheries, 1880, Pt. 6, p. 424, pl. XIII, figs. 87, 88.

Heterotanais limicola NORMAN and STEBBING, Trans. Linn. Soc. Lond., XII, 1886. Pt. 4, p. 109.

Habitat.—Massachusetts Bay, off Salem.

Depth.—48 fathoms.

6. LEPTOCHELIA Dana.

ANALYTICAL KEY TO THE SPECIES OF LEPTOCHELIA.

a. Gnathopods in male greatly elongated, with tuberculate immobile finger. Upper antennæ three-jointed, and with rudimentary flagellum in female, much more elongated, and with a multi-articulate flagellum in male.
  b. Outer branch of uropoda one-jointed.
    c. Inner branch of uropoda five-jointed. Antennulæ, with basal segment nearly one-half the length of the whole organ, are more than one-third as long as the body .... 8. *Leptochelia rapax* Harger.
    c′. Inner branch of the uropoda six-jointed. Antennulæ, with basal segment about one-third the length of the whole organ, are about two-thirds as long as body .... 9. *Leptochelia savignyi* (Krøyer).
  b′. Outer branch of uropoda two-jointed .... 10. *Leptochelia minuta* Dana.
a′. Gnathopods in male not greatly elongated. Upper antennæ three-jointed, not elongated in male.
  b. Inner branch of uropoda six-jointed. Terminal abdominal segment pointed posteriorly .... 11. *Leptochelia lubia* (Krøyer).
  b′. Inner branch of the uropoda five-jointed. Terminal abdominal segment rounded behind .... 12. *Leptochelia* (?) *filum* (Stimpson).

8. LEPTOCHELIA RAPAX Harger.

Leptochelia rapax HARGER, Proc. U. S. Nat. Mus., II, 1879, p. 163; Report U. S. Commissioner of Fish and Fisheries, 1880, Pt. 6, p. 424–426, pl. XIII, figs. 89, 90.

Habitat.—Annisquam, Massachusetts.

Depth.—One-half fathom.

9. LEPTOCHELIA SAVIGNYI (Krøyer).

Tanais savignyi KRØYER, Nat. Tidsskr., IV, p. 168, pl. II, figs. 1–12.

Tanais edwardsii KRØYER (female), Nat. Tidsskr., IV, p. 181, pl. II, figs. 13–19.

Leptochelia algicola HARGER (female), Report U. S. Fish Com., 1880, Pt. 6, pp. 421–423, pl. XIII, figs. 83, 84a–b, 85.

Habitat.—Great Egg Harbor, New Jersey; also England; France; Azores; Mediterranean; Madeira.

Depth.—Found on surface.

10. LEPTOCHELIA MINUTA Dana.

Leptochelia minuta DANA, Am. Jour. Sci., VIII, 1849, p. 425; U. S. Exp. Exped., 1852, XIV, p. 800, pl. LIII, figs. 5a–d.

Delochochelia forresti STEBBING, Ann. and Mag. Nat. Hist., (6) XVII, 1896, pp. 49–56.

Leptochelia minuta STEBBING, Ann. Mag. Nat. Hist. (6), XVII, 1896, pp. 156–160.

Habitat.—West Indies; also Fiji Islands.

Depth.—Shallow water.

11. LEPTOCHELIA DUBIA (Krøyer).

Tanais dubius KRØYER, Nat. Tidsskr., IV, p. 178, pl. II, figs. 20–22.

Leptochelia edwardsii (male) BATE and WESTWOOD, Brit. Sess. Crust., II, 1868, p. 134.

Tanais filum HARGER, Report U. S. Commissioner of Fish and Fisheries, 1874, Pt. 1, p. 573 (279).—VERRILL, Report U. S. Commissioner of Fish and Fisheries, 1874, Pt. 1, p. 381 (87).

Paratanais algicola (male) HARGER, Am. Jour. Sci., XV, 1878, p. 377.

Leptochelia algicola (male) HARGER, Proc. U. S. Nat. Mus., II, 1879, p. 162; Report U. S. Commissioner of Fish and Fisheries, 1880, Pt. 6, pp. 421–423, pls. XII, fig. 80, and XIII, fig. 86.

Leptochelia dubia NORMAN and STEBBING, Trans. Linn. Soc. Lond., XII, 1886, pt. 4, p. 108.

Habitat.—Noank, Connecticut; Woods Hole and Provincetown, Massachusetts; also Island of Guernsey, British Channel; Ireland; Atlantic coast from Brittany to Senegal and Teneriffe; Mediterranean; Brazil.

Depth.—Surface to one-half fathom.

12. LEPTOCHELIA (?) FILUM (Stimpson).

Tanais filum STIMPSON, Mar. Inv. Grand Manan, 1853, p. 43.—HARGER, Am. Journ. Sci., XV, 1878, p. 378.

Leptochelia filum HARGER, Proc. U. S. Nat. Mus., II, 1879, p. 164; Report U. S. Commissioner of Fish and Fisheries, 1880, Pt. 6, p. 427.

Habitat.—Gulf of St. Lawrence.

Depth.—8 fathoms.

7. NEOTANAIS Beddard.

13. NEOTANAIS AMERICANUS Beddard.

Neotanais americanus BEDDARD, Challenger Report, XVII, 1886, pp. 124, 125, pl. XVI, figs. 4–6.

Habitat.—Southeast of New York; 38° 34′ N. lat., 72° 10′ W. long.; also 35° 39′ S. lat., 50° 47′ W. long

Depth.—1,240 fathoms

Family II. APSEUDIDÆ.

ANALYTICAL KEY TO THE GENERA OF APSEUDIDÆ.

a. Lower antennæ with a scale articulated to the end of the second joint. Head and first thoracic segment coalesced.

  b. Exopods present on both pairs of gnathopods.................. 8. *Apseudes*.

  b′. Exopods absent on both pairs of gnathopods................ 9. *Typhlapseudes*.

a′. Lower antennæ without a scale. Head and first two thoracic segments coalesced.. 10. *Sphyrapus*.

8. APSEUDES Leach.

14. APSEUDES GRACILIS Norman and Stebbing.

Apseudes gracilis NORMAN and STEBBING, Trans. Zool. Soc. Lond., XII, 1886, Pt. 4, p. 95–97, pl. XX.

Habitat.—Davis Strait, lat. 59° 10′ N., long. 50° 26′ W., also in the North Atlantic.

Depth.—1,750 fathoms.

9. TYPHLAPSEUDES Beddard.

15. TYPHLAPSEUDES NEREUS Beddard.

Typhlapseudes nereus BEDDARD, Proc. Zool. Soc. Lond., 1886, Pt. 1, p. 115; Report on the Scientific Results of the Expl. Voyage of H. M. S. Challenger, Zool., XVII, pp. 112, 113.

Habitat.—Off Sombrero Island.

Depth.—450 fathoms.

10. SPHYRAPUS Norman and Stebbing.

16. SPHYRAPUS MALLEOLUS Norman and Stebbing.

Sphyrapus malleolus NORMAN and STEBBING, Trans. Zool. Soc., XII, 1886, p. 98, pl. XXII, figs. 2, 3.—BONNIER, Annales de l'Univers. de Lyons, 1896, p. 665, pl. XXXI, fig. 1.

Habitat.—South of Cape Farewell, Greenland; also 39° 39′ N. lat., 9° 39′ W. long., off coast of Portugal; south of Rockall; Bay of Biscay.

Depth.—1,450 fathoms.

II. FLABELLIFERA or CYMOTHOIDEA.

ANALYTICAL KEY TO THE FAMILIES OF FLABELLIFERA.

a. Legs in adult in six, apparently only five, pairs ..Family III. *Gnathiidæ* (p. 506).

a′. Legs in adult in seven pairs.

- *b.* Uropoda lateral and superior, outer branch arching over base of telson. Body cylindrical, narrow, elongated......Family IV. *Anthuridæ* (p. 507).
- *b′.* Uropoda lateral.
  - *c.* Abdomen consisting of six segments.
    - *d.* Uropoda with both branches developed; mostly lamelliform.
      - *e.* [1] Maxillipeds with the palp free; the margins of the last two joints more or less setose, never furnished with hooks.
        - *f.* Mandibles with the distal half stout, very conspicuous, uncovered, or with only the anterior margin concealed; from the base toward the middle directed forward and a little outward.
          - *g.* Mandibles with the rather broad, more or less tridentate, cutting edges meeting squarely behind the large upper lip; the secondary plate and peculiar equivalent for the molar well developed. First maxillæ having the plate of the first joint armed with three spines, that of the third with many. Second maxillæ of moderate size, the three free plates very setose. Maxillipeds with the palp rather broad, very setose.................Family V. *Cirolanidæ* (p. 510).

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[1] Points from *e* to *e′* inclusive are from Hansen's analytical key to the Cirolanidæ, Vidensk. Selsk. Skr., 6th ser., natur. og math. Afd. V, 1890, p. 317.

g'. Mandibles with the distal part produced into a long prominent process, the pair much overlapping; the secondary plate and molar evanescent. First maxillæ having the plate of the first joint unarmed, of the third carrying one very long spine. Second maxillæ small and feeble, the free plates almost rudimentary, with few setæ. Maxillipeds with the palp narrowed, not very setose.
Family VI. *Corallanidæ* (p. 517).

f'. Mandibles with the distal half narrow, most or all of it concealed by the upper and lower lips; from the base toward the apex directed gradually inward..................Family VII. *Alcironidæ* (p. 519).

e'. Maxillipeds with the palp embracing the cone formed by the distal parts of the mouth organs, the inner upper margin and apex never setose, the apex and sometimes the inner upper margin, at least in the males and in females without eggs, being furnished with outward-curved hooks.

f. Mandibles with the secondary plate very often visible; palp with no inflated joint. Maxillipeds commonly seven-jointed, sometimes four-jointed, the last joint in the latter case rather short, obtuse. Antennæ long, unequal, with well-defined peduncle and flagellum.
Family VIII. *Ægidæ* (p. 520).

f'. Mandibles with no secondary plate; the palp in adults with first joint or both first and second joints inflated. Maxillipeds always four-jointed, last joint rather long and narrow, subacute. Antennæ much reduced, without clear distinction between peduncle and flagellum.
Family. IX. *Cymothoidæ* (p. 525).

d'. Uropoda with one of the branches almost obsolete or rudimentary—not lamelliform........................Family X. *Limnoriidæ* (p. 532).

c'. Abdomen consisting of less than six segments. Abdomen with two segments. Uropoda with one branch fixed, immovable.
Family XI. *Sphæromidæ* (p. 532).

Family III. GNATHIIDÆ.

11. GNATHIA Leach.

ANALYTICAL KEY TO THE SPECIES OF GNATHIA.

a. Mandibles in male with the basal part ornamented on the superior margin with an elevated crest, which is irregularly dentate. Legs furnished with many spiny processes .... 17. *Gnathia cristata* (Hansen).

a'. Mandibles in male without elevated crest on the superior margin. Legs without spiny processes.

b. Mandibles in male with slight notch outside, inner edge obtusely produced in the middle, tip acute, slightly incurved. Front of head not produced in the middle beyond the antero-lateral angles.... 18. *Gnathia elongata* (Krøyer).

b'. Mandibles in male carinate on outer side near the middle, the carina ending in a tooth-like process, irregularly and bluntly toothed near the base within, turned upward at apex. Front of head produced in the middle much beyond the antero-lateral angles .... 19. *Gnathia cerina* (Stimpson).

17. GNATHIA CRISTATA (Hansen).

Anceus cristatus HANSEN, Vidensk. Meddel. naturh. Foren. i. Kjoebh., 1887, p. 182, pl. VII, fig. 2–2a.

Habitat.—72° 32′ lat. N., 58° 51′ long. W.

Depth.—116 fathoms.

18. GNATHIA ELONGATA (Krøyer).

Anceus elongatus Krøyer, Voy. en Scand., Crust., pl. xxx, fig. 3a–g; Naturh. Tidsskr. Ny R. II, p. 388, 1847.—Hansen, Vidensk. Meddel. naturh. Foren in Kjoebh., 1887, p. 182.
Gnathia elongata G. O. Sars, Crust. of Norway, II, Pts. 3, 4, p. 55, 1897, pl. xxiii, fig. 1.

Habitat.—West Greenland; also coast of Finmark; Lofoten Islands; Kara Sea.

Hansen says that it is impossible to decide whether *Pranzina reinhardi* belongs to this or to another species of *Gnathia.* Krøyer's two original specimens have not been preserved, and although in the Copenhagen Museum there are four specimens of Krøyer's species identified, it can not be known if one or two of these are the original specimens.

19. GNATHIA CERINA (Stimpson).

Praniza cerina Stimpson, Mar. Inv. Grand Manan, 1853, p. 42, pl. iii, fig. 31.—Verrill, Am. Jour. Sci., VI, 1873, p. 439; VII, 1874, pp. 38, 41, 411, 502; Proc. Am. Assoc., 1873, pp. 350, 354, 358, 362, 1874.
Anceus americanus Stimpson, Mar. Inv. Grand Manan, 1853, p. 42.
Gnathia cerina Harger, Proc. U. S. Nat. Mus., II, 1879, p. 162; Report U. S. Commissioner of Fish and Fisheries, 1880, Pt. 6, p. 410–413, pl. xii, figs. 75–79.

Habitat.—Bay of Fundy; Massachusetts Bay; off Salem; Gulf of Maine; Casco Bay; Gulf of St. Lawrence.

Depth.—10 to 220 fathoms.

Family IV. ANTHURIDÆ.

ANALYTICAL KEY TO THE GENERA OF ANTHURIDÆ.[1]

a. Labium terminating in two rounded lobes. Mandibles with cutting edge of two or three blunt teeth, and a semicircular saw in place of molar and spine-row; palp three-jointed. First maxillæ simple, with apical teeth. Maxillipeds with three to six broad flattened joints.
  b. First five segments of abdomen coalesced into single segment in female.
    c. Maxillipeds three-jointed. Flagella of both pairs of antennæ few jointed in female; of first multiarticulate in male........................12. *Anthura.*
    c′. Maxillipeds four-jointed. Flagella of both pairs of antennæ rudimentary, of the first pair not greatly developed in male..................13. *Cyathura.*
  b′. Segments of abdomen distinct. Maxillipeds six-jointed........14. *Anthelura.*
a′. Labium terminating in two points, acuminate. Mandibles without teeth, lancet-like, lobes at base forming channel. First maxillæ spear-like, distally channeled and serrate. Maxillipeds elongate, with four to five joints, the second of which is elongate. Abdomen with six segments and telson distinct. Antennæ in both sexes with many-jointed flagella....15. *Calathura.*

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[1] Stebbing's key to the Anthuridæ has been used as given in Trans. Zool. Soc. Lond., XII, 1886, Pt. 4, pp. 121, 122.

12. ANTHURA Leach.

20. ANTHURA TENUIS (Harger).

Ptilanthura tenuis HARGER, Am. Jour. Sci., XV, 1878, p. 377; Proc. U. S. Nat. Mus., 1879, II, p. 62; Report U. S. Commissioner of Fish and Fisheries, 1880, Pt. 6, p. 406–408, pls. XI, XII, figs. 71–74.

Anthura tenuis NORMAN and STEBBING, Trans. Linn. Soc. Lond., XII, 1886, Pt. 4, p. 124.

Habitat.—Noank Harbor, Connecticut; Long Island Sound; off Watch Hill, Rhode Island; off Block Island; Waquoit, Vineyard Sound; Casco Bay, Maine; Grand Manan, New Brunswick.

Depth.—Surface to 19 fathoms.

13. CYATHURA Norman and Stebbing.

21. CYATHURA CARINATA (Krøyer).

? *Anthura gracilis* DE KAY, Zool. New York, Crust., p. 44, pl. IX, fig. 34, 1844.

Anthura carinata KRØYER, Naturh. Tidsskr. (2), II, p. 402; Voy. en Scand., pl. xxvii, fig. 3.—SCHIOEDTE, Krebs, Sugem., Naturh. Tidsskr. (3), X, p. 211, pl. IV, figs. 1–14; Ann. Nat. Hist. (4), XVIII, 1876, p. 253.—MEINERT, Crust. Amphip. et Decap. Daniæ, Naturh-Tidsskr (3), XI, 1877, p. 77; XII, 1880, p. 470.

Anthura polita STIMPSON, Proc. Acad. Nat. Sci. Phil., VII, 1856, p. 393.—HARGER, Proc. U. S. Nat. Mus., II, 1879, p. 162.

Anthura brunnea HARGER, Report U. S. Fish Com., Pt. 1, 1874, p. 572 (278).—VERRILL, Report U. S. Fish Com., 1874, Pt. 1, p. 426 (132).

Anthura polita HARGER, Report U. S. Fish Com., 1880, Pt. 6, pp. 398–402, pl. XI, figs. 68, 69.

Cyathura carinata NORMAN and STEBBING, Trans. Zool. Soc. Lond., XII, 1886, Pt. 4, p. 124–125.

Habitat.—Norfolk, Virginia; Great Egg Harbor, New Jersey; Long Island Sound; Noank Harbor, Connecticut; off Block Island; East Providence, Rhode Island; Vineyard Sound; Gloucester, Massachusetts; Greenland; Denmark.

Depth.—Surface to 19½ fathoms.

14. ANTHELURA Norman and Stebbing.

22. ANTHELURA ABYSSORUM Norman and Stebbing.

Anthelura abyssorum NORMAN and STEBBING, Trans. Zool. Soc. Lond., XII, 1886, Pt. 4, p. 127–128, pl. XXVII, fig. 2.

Habitat.—Near entrance of Davis Straits, lat. 59° 10′ N., long. 50° 25′ W.

Depth.—1,750 fathoms.

15. CALATHURA Norman and Stebbing.

ANALYTICAL KEY TO THE SPECIES OF CALATHURA.

a. Eyes not conspicuous. First pair of antennæ with flagellum twelve jointed, not longer than the length of the head. Second pair of antennæ with the flagellum twelve jointed. First three segments of thorax bounded laterally by carinæ. Terminal segment of body triangular, acute at apex, margin not crenulate. Superior or outer branch of uropoda oval in form, slightly dentated. Inner branch acutely triangular.. 23. *Calathura branchiata* (Stimpson).

a'. Eyes conspicuous. First pair of antennæ with flagellum seventeen jointed, more than twice as long as the length of the head. Second pair of antennæ with the flagellum twenty-three jointed. First three segments of thorax not bounded laterally by carinæ. Terminal segment of body linguate, rounded posteriorly, with crenulate margin. Superior or outer branch of the uropoda narrow, elongated, not dentated. Inner branch rounded.
24. *Calathura crenulata*, new species.

23. CALATHURA BRANCHIATA (Stimpson).

Anthura branchiata STIMPSON, Mar. Inv. Grand Manan, 1853, p. 43.—VERRILL, Am. Jour. Sci., V, p. 101, 1873; VII, 1874, pp. 42, 411, 502; Proc. Am. Assoc., 1873, pp. 350, 357; Report U. S. Fish Com., 1874, Pt. 1, p. 511 (217).—HARGER, Report U. S. Fish Com. 1874, Pt. 1, p. 573 (279).—SMITH and HARGER, Trans. Conn. Acad., III, 1874, p. 16.

Paranthura branchiata HARGER, Report U. S. Fish Com., 1880, pp. 402–405, pl. XI, fig. 70.—AXEL OHLIN, Bidrag till Kannedomen om Malakostralsfaunan i Baffin Bay och Smith Sound, 1895, pp. 12, 13.

Paranthura norvegica G. O. SARS, Bidrag till Kundskaben om Dyrelivet paa vore Havbanken, Vidensk. Selsk. Forhandl., 1872, p. 88.

Anthura arctica HELLER, Crust. Pycnogoniden und Tunicaten der k.-k. Österr. Ungar. Nordpol Expedit., 1876, p. 14, pl. IV, figs. 2–12.—G. O. SARS, Prodrom. descrip. Crust. et Pycnogon. in exped. Norveg., 1876, in Archiv for Mathemat. og Naturvidenskab, p. 347.

Calathura branchiata NORMAN and STEBBING, Trans. Linn. Soc. Lond., XII, 1886, Pt. 4, pp. 131–133, pl. XXVI, fig. 1.

Habitat.—Bay of Fundy; Vineyard Sound; Georges Bank; Gulf of Maine; Casco Bay; Nova Scotia; between Misaine Bank and Middle Ground; between Middle Ground and Halifax; 70° 8′ N. lat., 74° 20′ W. long.; also off Norway, Scotland, Ireland, and between England and Bay of Biscay.

Depth.—10 to 200 fathoms.

24. CALATHURA CRENULATA, new species.

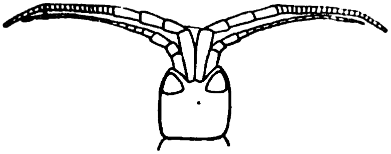

FIG. 1.—HEAD OF CALATHURA CRENULATA.

Head half as long as first thoracic segment, frontal margin with small median point and prominent lateral angles. Eyes large, distinct, and very black. First pair of antennæ more than twice as long as the length of the head; flagellum about seventeen jointed. Second pair of antennæ somewhat longer than first pair, with joints of flagellum stouter; flagellum about twenty-three jointed.

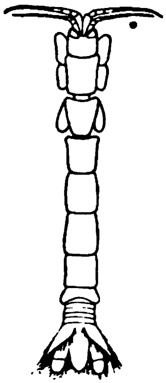

FIG. 2.—CALATHURA CRENULATA.

First six thoracic segments long and narrow; second segment narrower posteriorly than anteriorly; last segment very short, one-third shorter than preceding segment. Abdomen with all the segments distinct. Terminal segment long, linguate in shape, rounded posteriorly with crenulate margin. Outer branch of uropoda arching over telson, but not meeting in center; narrow, elongated. Inner branch of uropoda extending beyond telson, rounded posteriorly, and shorter than peduncular joint; inner margin crenulate. Abdomen about equal in length to fifth and sixth thoracic segments taken together.

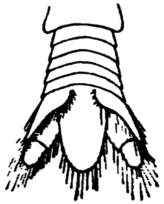

FIG. 3.—ABDOMEN.

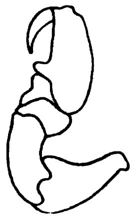

FIG. 4.—FIRST GNATHOPOD.

First pair of gnathopods large, subchelate; second pair of gnathopods and first pair of pereiopods subchelate, small. Other pereiopods ambulatory, slender.

One specimen (type) sent by Mr. F. Stearns to the U. S. National Museum comes from between Nassau and Andros Island, Bahamas. Another specimen was taken by the U. S. Fish Commission steamer *Albatross* off Cape Catoche, Yucatan.

Type.—Cat. No. 23900, U.S.N.M.

Family V. CIROLANIDÆ.

ANALYTICAL KEY TO THE GENERA OF CIROLANIDÆ.

a. No branchiæ developed at the base of the pleopoda. Eyes situated on the superior side and very often also on the inferior side of the head.

b. Peduncle of second antennæ five jointed. Plate of second joint of maxillipeds furnished with hooks. Uropoda with inner angle of peduncle produced.

c. First and second pairs of pleopoda equal in length with at least the inner branch submembranaceous.................................... 16. *Cirolana.*

c′. First pair of pleopoda with both branches hard, and forming a large operculum; second pair of pleopoda submembranaceous............. 17. *Conilera.*

b′. Peduncle of second antennæ four jointed. Plate of second joint of maxillipeds without hooks. Uropoda with inner angle of peduncle very little produced. Pleopoda with both branches submembranaceous. Superior antennæ with first joint of peduncle quite short, and extended straight in front at a right angle to remaining part of the antenna...................... 18. *Eurydice.*

a′. Branchiæ well developed at the base of the pleopoda. Eyes developed only on the inferior side of the head.............................. 19. *Bathynomus.*

16. CIROLANA Leach.

ANALYTICAL KEY TO THE SPECIES OF CIROLANA.

a. Fifth abdominal segment, with lateral angles free, not covered by fourth segment.

b. Body short. Terminal abdominal segment tricarinated. Inner branch of uropoda much longer than outer branch. First pair of antennæ short, reaching only posterior margin of head; second pair not armed with brushlike structure on flagellum. Sides of head angulated. Frontal lamina forming a large, rounded projection, extending beyond the apex of the head, and separate from the frontal process .... 25. *Cirolana sphæromiformis* Hansen.

b'. Body elongate, ovate. Terminal abdominal segment smooth. Inner branch of uropoda shorter than outer branch. First pair of antennæ long, reaching the posterior margin of the first thoracic segment; second pair armed with a brushlike structure on flagellum. Sides of head rounded. Head produced in front, contiguous with frontal lamina. 26. *Cirolana mayana* Ives.

a'. Fifth abdominal segment, with lateral angles covered by the fourth segment.

b. Frontal lamina posteriorly or clypeus anteriorly produced hornlike, especially so when seen from the side.

c. First pair of antennæ short, reaching only to the posterior margin of the head. Without indications of four low tubercles on head. Terminal abdominal segment armed with eight spines ... 27. *Cirolana minuta* Hansen.

c'. First pair of antennæ long, reaching the posterior margin of the first thoracic segment. With indications of four low tubercles on head. Terminal abdominal segment without spines, crenulate on its posterior margin .... 28. *Cirolana virginiana* Richardson.

b'. Frontal lamina and clypeus unarmed, not produced horn-like; anterior margin of the clypeus connected with the frontal lamina.

c. Frontal lamina narrow, elongate, from four to six times longer than broad.

d. Extremity of exterior margin of inner branch of the uropoda emarginate.

e. Terminal segment emarginate at its extremity. 29. *Cirolana concharum* (Stimpson).

e'. Terminal segment not emarginate at its extremity. 30. *Cirolana impressa* Harger.

d'. Extremity of exterior margin of the inner branch of the uropoda not emarginate.

e. Second pair of antennæ long, extending beyond the posterior margin of the third thoracic segment.

f. Eyes small, black, longer than wide. Branches of uropoda narrow, lanceolate, somewhat elongated; inner branch almost three times longer than wide. Clypeus smooth, even. Terminal segment posteriorly rounded .... 31. *Cirolana borealis* Lilljeborg.

f'. Eyes large, brown, as long as wide. Branches of uropoda short; inner branch hardly twice longer than wide. Clypeus with margin raised all around and in the middle, surrounding two impressed areas. Terminal segment truncated obliquely with apex acute. 32. *Cirolana gracilis* Hansen.

e'. Second pair of antennæ short, reaching the middle of the first thoracic segment .... 33. *Cirolana polita* (Stimpson).

c'. Frontal lamina broad, short, scarcely twice as long as wide.

d. Terminal segment truncate........... 34. *Cirolana obtruncata*, new species.

d'. Terminal segment not truncate, rounded.

c. Body two and two-thirds longer than broad. Second pair of antennæ reach the posterior margin of fourth thoracic segment. Outer branch of uropoda with apex bifid. Color, light brown.
35. *Cirolana parva* Hansen.

c'. Body three and two-thirds longer than broad. Second pair of antennæ reach the posterior margin of third thoracic segment. Outer branch of uropoda with apex not bifid. Color, white.
36. *Cirolana albida*, new species.

25. CIROLANA SPHÆROMIFORMIS Hansen.

Cirolana sphæromiformis HANSEN, Vidensk. Selsk. Skr. (6), V, 1890, pp. 351–353, pl. IV, figs. 3–3g.

Habitat.—St. Thomas, West Indies.

26. CIROLANA MAYANA Ives.

Cirolana mayana IVES, Proc. Phil. Acad. Nat. Sciences, 1891, pp. 186–187, pl. VI, figs. 3–10.

Habitat.—Coast of Yucatan; Santa Marta, U. S. Columbia.

27. CIROLANA MINUTA Hansen.

Cirolana minuta HANSEN, Vidensk. Selsk. Skr. (6), V, pp. 347, 348, pl. III, figs. 5–5d; pl. IV, figs. 1–1f, 1890.

Habitat.—St. Thomas, West Indies.

28. CIROLANA VIRGINIANA Richardson.

Cirolana virginiana RICHARDSON, Am. Nat., XXXIV, p. 216, 1900.

Body not quite twice as long as broad, oval, thickset. Head transverse, with indications of four small tubercles, two on the anterior portion, between the eyes, and two on the posterior portion. Eyes large, lateral. First pair of antennæ long, nearly as long as the second pair, reaching the posterior margin of the first thoracic segment; flagellum twelve jointed. Second pair of antennæ extend to the middle of the third thoracic segment; flagellum eighteen jointed.

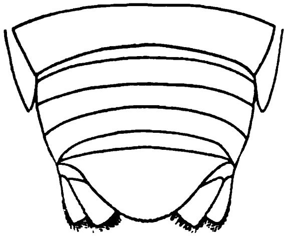
FIG. 5.—ABDOMEN OF CIROLANA VIRGINIANA.

First thoracic segment one and a half times longer than any of the other segments. Following segments of equal length. First abdominal segment almost entirely concealed by last thoracic segment. Four succeeding segments of equal length. Terminal segment very short and narrow, not longer than the four abdominal segments taken together, posteriorly rounded and crenulate. Both branches of the uropoda crenulate. Inner branch broad and equalling in length the terminal segment. Outer branch narrower and a little shorter than inner branch.

Abdomen minutely granulose.

Color, light brown.

Two specimens were collected by the U. S. Fish Commission steamer *Albatross* in Chesapeake Bay.

Depth.—81 fathoms.

Type.—Cat. No. 6350, U.S.N.M.

29. CIROLANA CONCHARUM (Stimpson).

Æga concharum Stimpson, Mar. Inv. Grand Manan, 1853, p. 42.—Lütken, Vidensk. Meddel., 1859, p. 77, 1860.

Conilera concharum Harger, Report U. S. Commissioner of Fish and Fisheries, 1874, Pt. 1, p. 572 (278).—Verrill, Report U. S. Commissioner of Fish and Fisheries, 1874, Pt. 1, p. 459 (165).

Cirolana concharum Harger, Proc. U. S. Nat. Mus., 1879, II, p. 161; Report U. S. Commissioner of Fish and Fisheries, 1880, Pt. 6, pp. 378–381, pls. IX, X, figs. 58–63.

Habitat.—Currituck, North Carolina; Charleston, South Carolina; Woods Hole, Massachusetts; Vineyard Sound; Block Island; Long Island Sound; Halifax, Nova Scotia.

Depth.—Surface to 18 fathoms.

30. CIROLANA IMPRESSA Harger.

Cirolana impressa Harger, Bull. Mus. Comp. Zool. Harvard College, XI, 1883, No. 4, pp. 93–95, pl. I, figs. 3–3d, pl. II, figs. 3–3c.—Verrill, Report U. S. Commissioner of Fish and Fisheries, 1883, p. 559, pl. XXXVI, fig. 165.

Habitat.—40° 2′ 24″ N. lat., 70° 23′ 40″ W. long.; 40° 3′ N. lat., 70° 31′ W. long.; 39° 57′ N. lat., 69° 47′ W. long.; 39° 55′ 28″ N. lat., 69° 47′ W. long.; Chesapeake Bay.

Depth.—115 to 321 fathoms.

31. CIROLANA BOREALIS Lilljeborg.

Cirolana borealis Lilljeborg, Ofvers. Vet. Akad. Forh., 1851, p. 23.

Cirolana hirtipes Heller, Verhandl. der k. k. Zoologisch-Botanischen Gesellschaft in Wien, XVI, 1866, p. 742.

Cirolana spinipes Bate and Westwood, Brit. Sess. Crust., II, p. 299.—Harger, Bull. Museum Comparative Zoology, XI, No. 4, 1883, p. 91, pl. I, figs. 2–2d; Pt. 2, figs. 1–1c.

Cirolana borealis Hansen, Vidensk. Selsk. Skr. (6), V, 1890, pp. 321, 322, pl. I, figs. 1–1v.—G. O. Sars, Crust. of Norway, II, Pts. 3, 4, 1897, p. 70.

Habitat.—Off Cape Florida; Atlantic coast of North America; also British Isles; Shetland Isles; coast of France; Mediterranean at Naples; coast of Norway.

Depth.—233 fathoms.

32. CIROLANA GRACILIS Hansen.

Cirolana gracilis Hansen, Vidensk. Selsk. Skr. (6), V, 1890, pp. 329–331, pl. II. fig. 2–2g.

Habitat.—St. Thomas, West Indies.

33. CIROLANA POLITA (Stimpson).

Æga polita Stimpson, Mar. Inv. Grand Manan, 1853, p. 41.—Lütken, Vidensk. Meddel., 1859, p. 77, 1860.—Verrill, Am. Jour. Sci., V, 1873, p. 16.

Conilera polita Harger, in Smith and Harger, Trans. Conn. Acad., III, 1874, pp. 3, 22.—Verrill, Am. Jour. Sci., VII, 1874, p. 411.

Cirolana polita Harger, Proc. U. S. Nat. Mus., 1879, II, p. 161; Report U. S. Commissioner of Fish and Fisheries, 1880, Pt. 6, pp. 381, 382.

Habitat.—Bay of Fundy; Cape Cod Bay; Salem, Massachusetts; Georges Bank; east of Banquereau.

Depth.—17 to 190 fathoms.

34. CIROLANA OBTRUNCATA, new species.

Head transversely oval. Eyes small, lateral. First pair of antennæ short, reaching a little beyond the posterior margin of the head; flagellum twelve jointed. Second pair of antennæ reach the middle of the third thoracic segment; flagellum, twenty-one jointed.

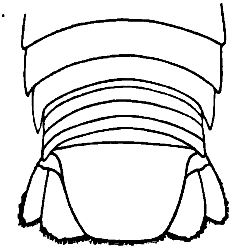

FIG. 6.—ABDOMEN AND LAST TWO THORACIC SEGMENTS OF CIROLANA OBTRUNCATA.

Thoracic segments subequal; first one somewhat longer than others. Epimera of second, third, and fourth segments posteriorly rounded; of fifth, sixth, seventh, and eighth segments pointed posteriorly.

First abdominal segment partly covered by last thoracic segment, following four segments subequal; terminal segment with its posterior margin truncate and minutely crenulate.

Uropoda not longer than posterior margin of terminal segment; inner branch longer and broader than outer branch, and crenulate. Both branches rounded posteriorly.

Color, brown.

Single specimen from Kingston, Jamaica; taken from surface.

Type.—Cat. No. 23901, U.S.N.M.

35. CIROLANA PARVA Hansen.

Cirolana parva Hansen, Vidensk. Selsk. Skr. (6), V, 1890, pp. 340, 341, pl. II, fig. 6–6b; pl. III, fig. 1–1d.

Habitat.—Key West, Florida; Gulf of Mexico; St. Thomas, West Indies; St. Croix, West Indies; between the delta of the Mississippi and Cedar Keys, Florida.

Depth.—25 to 27 fathoms.

36. CIROLANA ALBIDA, new species.

Body narrow, elongate, three and two-thirds times longer than broad. Head transverse, eyes large, black. First pair of antennæ extend to the end of the peduncle of the second pair; flagellum nine jointed. Second pair of antennæ extend to the posterior margin of the third thoracic segment; flagellum, twenty-three jointed.

First thoracic segment but little longer than those following, which are subequal in length.

First abdominal segment entirely covered by seventh thoracic segment. Terminal segment triangulate with rounded extremity, its posterior margin denticulate and bearing eight spines, the spines alternating with the teeth. The uropoda reach the end of the terminal segment; the inner branch is obliquely truncate posteriorly, and armed with spines; the outer branch is shorter and more slender than the inner branch, is pointed at its extremity, and armed posteriorly and on its external margin with spines.

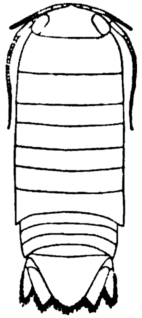
FIG. 7.—CIROLANA ALBIDA.

Color white, with scattered black spots.

Several specimens were taken by Mr. E. L. Morris at Sugarloaf Key, Florida.

Type.—Cat. No. 23902, U.S.N.M.

17. CONILERA Leach.

37. CONILERA CYLINDRACEA (Montagu).

Oniscus cylindraceus MONTAGU, Trans. Linn. Soc. Lond., VII, 1803, p. 71, pl. VI, fig. 8.

Conilera montagui LEACH, Diction. d. Scienc. Natur., XII, p. 348.—DESMAREST, Consid. Crust., p. 304.—MILNE-EDWARDS, Hist. Nat. d. Crust., III, p. 242.

Conilera cylindracea BATE and WESTWOOD, Brit. Sess.-Eyed Crust., II, p. 304.—HANSEN, Vidensk. Selsk. Skr. (6), V, 1890, pp. 358–361, pl. IV, figs. 5–5c; pl. V, figs. 1–1d, 1890.

Habitat.—Off South Carolina; between the Delta of the Mississippi and Cedar Keys, Florida; also Gulf of Naples; coast of England; coast of France.

Depth.—111 to 159 fathoms.

18. EURYDICE Leach.

ANALYTICAL KEY TO THE SPECIES OF EURYDICE.

a. Terminal segment of body with the posterior margin widely emarginate in the middle, the post-lateral angles obliquely truncate, and each ornamented with two robust spines, the inner one much longer than the outer one. Base of segment with a deep transverse impression in the median line, and a deep lateral impression on either side .... 38. *Eurydice spinigera* Hansen.

a′. Terminal segment rounded posteriorly with post-lateral triangular teeth, between which, a space intervening, the posterior margin is denticulate, a spine alternating with each tooth. Base of segment without any transverse depressions, evenly convex .... 39. *Eurydice convexa* Richardson.

38. EURYDICE SPINIGERA Hansen.

Eurydice spinigera HANSEN, Vidensk. Selsk. Skr. (6), V, 1890, pp. 367–369, pl. v, figs. 4–4c; pl. VI, figs. 1–1c.

Habitat.—West Indies.

39. EURYDICE CONVEXA Richardson.

Eurydice convexa RICHARDSON, Am. Nat., XXXIV, p. 217, 1900.

Head transverse; anterior margin rounded. Eyes quadrangular. First pair of antennæ short, reaching the middle of the last peduncular joint of the second pair of antennæ, or the posterior margin of the head; flagellum four jointed. Second pair of antennæ long, reaching the anterior margin of the terminal abdominal segment in the female; flagellum eighteen jointed. In the male the second pair of antennæ are equal to the entire length of body, reaching the tip of the terminal segment.

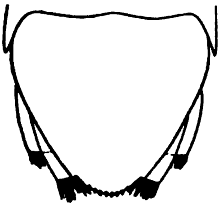

FIG. 8.—TERMINAL ABDOMINAL SEGMENT OF EURYDICE CONVEXA.

Thoracic segments subequal in length.

Abdomen in female shorter than thorax and head together; abdomen in male about equal to thorax and head.

First five segments equal in length. Terminal segment rounded posteriorly, with post-lateral triangular teeth, between which, a space intervening, the posterior margin is denticulate, a spine alternating with each tooth. The uropoda are short, not reaching the extremity of terminal segment. Both branches are truncate and crenulate on their exterior margins and fringed with long hairs.

Color, light brown, with odd-shaped markings of black.

A number of specimens were taken by the U. S. Fish Commission steamer *Albatross* at Cape San Blas, Florida.

Type.—Cat. No. 10049, U.S.N.M.

19. BATHYNOMUS Milne-Edwards.

40. BATHYNOMUS GIGANTEUS Milne-Edwards.

Bathynomus giganteus Milne-Edwards, Ann. N. H. (5) III, 1879, pp. 241–243.

Habitat.—West Indies.

Depth.—955 fathoms.

Family VI. CORALLANIDÆ.

20. CORALLANA Dana.

ANALYTICAL KEY TO THE SPECIES OF CORALLANA.[1]

a. Eyes moderate or large, some distance apart in the middle at the upper end.
  b. Left mandible, seen in position, with the apical part profoundly trifid. Clypeus and labrum very conspicuous.
    c. Basal article of the first pair of antennæ narrow, without spine. Head of male ornamented with three horn-like tubercles. First segment of body not ornamented with tubercules .... 41. *Corallana tricornis* Hansen.
    c'. Basal joint of the first pair of antennæ dilated, ornamented with spine at inner exposed angle. Head of male ornamented with four horn-like tubercles. First segment of body ornamented with two tubercles.
42. *Corallana sexticornis*, new species.
  b'. Left mandible, seen in position, with the apical part obscurely trifid, or forming a single apex. Labium and clypeus partly or very often entirely covered by the mandibles.
    c. Basal joint of the peduncle of the antennulæ moderately narrow, seen from below not prominent above the basal joints of the antennæ. Last segment of the abdomen not ornamented with basal tubercles near the median line .... 43. *Corallana quadricornis* Hansen.
    c'. Basal joint of the peduncle of the antennulæ very much dilated, seen from below so prominent that the basal joints of the antennæ are placed in a transverse cleft moderately deep between the antennulæ and the mandibles. Last segment of the body ornamented with two large basal tubercles situated near the median line.
      d. Fourth and fifth segments of the abdomen a little impressed in the dorsal median line, not ornamented with carinæ or tubercles. Last segment of the abdomen with two spines at the apex.. 44. *Corallana subtilis* Hansen.
      d'. Fourth and fifth segments of the abdomen with a deep longitudinal excavation in the dorsal median line, ornamented with many carinæ and tubercles. Last segment of the abdomen with four spines at the apex.
45. *Corallana antillensis* Hansen.
a'. Eyes very large, contiguous in the middle of the head.
  b'. Last segment of the abdomen rather short, widely rounded posteriorly and with a median excavation deep and moderately wide.
46. *Corallana fissicauda* Hansen.
  b'. Last segment of the abdomen rather long, narrowly rounded posteriorly, with no excavation.
    c. Fourth and fifth segments of the abdomen deeply excavate longitudinally in the dorsal median line and ornamented with carinæ. Last segment of the body with an incision in the middle of the side, and ornamented on the dorsal surface with two densely setose areas and with two large basal tubercles situated near the median line.... 47. *Corallana oculata* Hansen.
    c'. Fourth and fifth segments of the body very little impressed in the dorsal median line, ornamented with no carinæ. Last segment of the abdomen entire at the sides, ornamented on the dorsal surface everywhere with very short hairs remotely scattered .... 48. *Corallana warmingii* Hansen.

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[1] This key, with the exception of the new species which is inserted, is taken entirely from Hansen. Vidensk. Selsk. Skr., 6th ser., natur. og math., Afd. V, 1890, pp. 378, 379.

41. CORALLANA TRICORNIS Hansen.

Corallana tricornis HANSEN, Vidensk. Selsk. Skr. (6), V, 1890, pp. 379–381, pl. VI, figs. 4–4p; pl. VII, figs. 1–1d.

Habitat.—Cape Catoche, Yucatan; between Tampa Bay and Dry Tortugas, Florida; between Delta of the Mississippi and Cedar Keys, Florida; St. Thomas, West Indies; St. Croix, West Indies; Jamaica; British Honduras.

Depth.—24 to 27 fathoms.

42. CORALLANA SEXTICORNIS, new species.

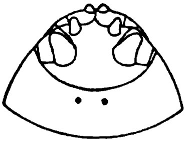

FIG. 9.—HEAD AND FIRST THORACIC SEGMENT OF CORALLANA SEXTICORNIS.

Head in the male ornamented with four spines, forming two transverse series of two spines each, the first being small, the second two very large and long, much longer than the first two and situated behind them. The first antennæ have the basal joint large and dilated, with a spine projecting outward from the inner exposed angle; the flagellum contains eight joints. The second antennæ with a flagellum of nineteen to twenty-one joints reach the posterior margin of the third thoracic segment. The head of the male is excavate above and deeply sunken below the level of the dorsal surface of the body. The head of the female is unornamented, with only a slight indication of two small tubercles in the place where the large spines are situated on the head of the male. The basal joints of the first antennæ of the female are large and dilated, but without the prominent spine characteristic of the male.

The first thoracic segment in the male is ornamented with two small tubercles situated close together on the anterior portion. These tubercles are wanting in the female. The posterior segments of the thorax and the abdominal segments are densely tubercular.

The terminal segment of the body is pointed posteriorly, and fringed with hairs. The uropoda are about as long as the terminal segment, the outer branch narrow, the inner branch wide; both are fringed with hairs and armed with a few spines.

One male and a number of females were collected by Henry Hemphill at Key West, Florida.

Type.—Cat. No. 13540, U.S.N.M.

43. CORALLANA QUADRICORNIS Hansen.

Corallana quadricornis HANSEN, Vidensk. Selsk. Skr. (6), V, 1890, p. 382, pl. VII, fig. 3.

Habitat.—St. Thomas, West Indies.

44. CORALLANA SUBTILIS Hansen.

Corallana subtilis HANSEN, Vidensk. Selsk. Skr. (6), V, 1890, pp. 382, 383, pl. VII, figs. 3–3c.

Habitat.—St. Thomas, West Indies.

45. CORALLANA ANTILLENSIS Hansen.

Corallana antillensis HANSEN, Vidensk. Selsk. Skr. (6), V, 1890, pp. 383, 384, pl. VII, figs. 4–4i.

Habitat.—Key West, Florida; St. Thomas, West Indies.
Depth.—Shallow water.

46. CORALLANA FISSICAUDA Hansen.

Corallana fissicauda HANSEN, Vidensk. Selsk. Skr. (6), V, 1890, pp. 385, 386, pl. VII, figs. 5–5d.

Habitat.—West Indies.

47. CORALLANA OCULATA Hansen.

Corallana oculata HANSEN, Vidensk. Selsk. Skr. (6), V, 1890, pp. 386, 387, pl. VII, figs. 6–6b.

Habitat.—West Indies.

48. CORALLANA WARMINGII Hansen.

Corallana warmingii HANSEN, Vidensk. Selsk. Skr. (6), V, 1890, pp. 387, 388, pl. VII, figs. 7–7f.

Habitat.—Off Cape Catoche, Yucatan; 17° 47′ S. lat., 35° 17′ W. long.
Depth.—24 fathoms.

Family VII. ALCIRONIDÆ.

21. ALCIRONA Hansen.

Clypeus very large, crescent shaped, the inner margin occupying more than half the outer side of the mandibles. Peduncle of the second pair of antennæ long. First three pairs of legs with the fifth joint not produced on the inner side, the last four pairs with the sixth joint not dilated.

49. ALCIRONA KREBSII Hansen.

Alcirona krebsii HANSEN, Vidensk. Selsk. Skr. (6), V, 1890, pp. 391, 392, pl. VIII, figs. 1–1q.

Habitat.—Off Cape Catoche, Yucatan; St. Thomas, West Indies.
Depth.—25 to 28 fathoms.

Family VIII. ÆGIDÆ.

ANALYTICAL KEY TO THE GENERA OF ÆGIDÆ.

a. Body rather compact. Superior antennæ short, with first two peduncular joints more or less expanded. Epistome large, linguiform, projecting between the bases of inferior antennæ. Maxillipeds with palp composed of five joints. Front separating the whole or a great part of the first article of the first pair of antennæ. Flagellum of first pair of antennæ composed of many articles. Abdomen compact .... 22. *Æga.*

a′. Body depressed. Superior antennæ short, with basal joints not expanded. Epistome very small and narrow. Maxillipeds with palp composed of only two joints. Front covering more or less the peduncle of the first pair of antennæ. Flagellum of first pair of antennæ composed of four to six articles. Abdomen relaxed.

  b. Eyes present. Anterior pairs of legs with propodus more or less expanded, dactylus forming a very large and evenly curved hook. Mandibles with the cutting edge expanded inside to a linguiform lamella; palp well developed, with basal joint much elongated. Abdomen not much narrower than thorax .... 23. *Rocinela.*

  b′. Eyes wanting. Anterior pairs of legs with propodus not expanded, dactylus abruptly curved in the middle and terminating in a very sharp point. Mandibles with the cutting edge simple, acuminate; palp of moderate length. Abdomen abruptly narrower than the thorax; terminal segment very large .... 24. *Syscenus.*

22. ÆGA Leach.

ANALYTICAL KEY TO THE SPECIES OF ÆGA.

a. Peduncle of the first pair of antennæ plane or concave, joints fitting into each other. Frontal lamina plane or concave.

  b. Terminal segment of body pointed at extremity.

    c. Eyes distant .... 50. *Æga psora* (Linnæus).

    c′. Eyes contiguous .... 51. *Æga antillensis* Schiœdte and Meinert.

  b′. Terminal segment of body not pointed at extremity.

    c Terminal segment posteriorly bisinuate. Surface of segment smooth, without carinæ .... 52. *Æga ecarinata* Richardson.

    c′. Terminal segment posteriorly emarginate or truncate.

      d. Eyes contiguous. Terminal segment truncate.. 53. *Æga crenulata* Lütken.

      d′. Eyes distant. Terminal segment emarginate... 54. *Æga webbii* (Guérin).

a′. Peduncle of the first pair of antennæ well rounded and with joints compressed. Frontal lamina convex or compressed and elevated.

  b. Eyes contiguous.

    c. Terminal segment of body whole, entire.
55. *Æga tenuipes* Schiœdte and Meinert.

    c′. Terminal segment of body not whole or entire.

      d. Terminal segment dentated ...... 56. *Æga dentata* Schiœdte and Meinert.

      d′. Terminal segment incised......... 57. *Æga incisa* Schiœdte and Meinert.

  b′. Eyes not contiguous.

    c. Terminal segment linguate, incised posteriorly, obscurely sulcate.
58. *Æga arctica* Lütken.

    c′. Terminal segment subtriangular, apex produced.

      d. Eyes minute, ovate. Terminal segment lightly carinated.
59. *Æga ventrosa* M. Sars.

      d′. Eyes large, round, occupying greater part of head. Terminal segment not carinated .... 60. *Æga gracilipes* Hansen.

50. ÆGA PSORA (Linnæus).

Oniscus psora LINNÆUS, Fauna suecica, 2d ed., 1761; Syst. Nat., 12th ed., I, 1767, p. 1060.—O. FABRICIUS, Fauna Grœnlandica, p. 249, 1780.

Æga emarginata LEACH, Trans. Linn. Soc., XI, 1815, p. 370; Dict. Sci. Nat., XII, 1818, p. 349.—DESMAREST, Consid. Crust., 1825, p. 305, pl. XLVII, figs. 4, 5.—MILNE-EDWARDS, Hist. Nat. des Crust., III, 1840, p. 240; Règne Anim., Crust., 1849, pl. IV, fig. 4; pl. LXVII, fig. 1.—GOULD, Rep. Geol. Mass., 1835, p. 549; Invert. Mass., 1841, p. 338.

Æga psora KRØYER, Dansk. Vid. Selsk. Afh., VII, 1838, p. 318.

Æga psora LILLJEBORG, Öfvers. Vet.-Acad. Förh., 1850, p. 84; 1851, p. 24.—LÜTKEN, Vidensk. Meddel., 1858, pp. 65, 179, 1859; 1860, p. 181 (7), 1861; Crustacea of Greenland, 1875, p. 150.—SCHIŒDTE, Ann. Mag. Nat. Hist. (4), I, 1868, p. 12.—BATE and WESTWOOD, Brit. Sess. Crust., II, 1868, p. 283, fig. —M. SARS, Chr. Vid. Selsk. Förh., 1868, 1869, p. 261.—G. O. SARS, Hard. Fauna, Crust., 1872, p. 275 (32).—VERRILL, Am. Jour. Sci. (3), V, 1873, p. 16.—SMITH and HARGER, Trans. Conn. Acad., III, 1874, p. 22; Meinert, Crust. Isop. Amph. Dec. Daniæ, 1877, p. 89.—MIERS, Ann. Mag. Nat. Hist. (4), XIX, 1877, p. 134.—HARGER, Proc. U. S. Nat. Mus., II, 1879, p. 161.

Æga entaillée LATREILLE, Règne Anim., IV, 1829, p. 134.

Æga psora HARGER, Report U. S. Commissioner of Fish and Fisheries, 1880, Pt. 6, pp. 384–387, pl. X, fig. 64. (See Harger for synonymy.)

Habitat.—Off Marthas Vineyard; Georges Bank; Browns Bank; La Have Bank; Gulf of Maine; Western Bank; Sable Island Bank; between St. Peters Bank and Banquereau; Newfoundland; Gulf of St. Lawrence; Labrador; Holsteinborg, Greenland; in Davis Straits; also Iceland; British Isles; North Sea; Finmark; Spitzbergen.

Depth.—30 to 218 fathoms.

51. ÆGA ANTILLENSIS Schiœdte and Meinert.

Æga antillensis SCHIŒDTE and MEINERT, Naturhistorisk Tidsskrift., XII, 1879–80, pp. 361, 362, pl. VIII, figs. 10–13.

Habitat.—Cuba; West Indies; off Cozumel.

Depth.—163 to 231 fathoms.

52. ÆGA ECARINATA Richardson.

Æga ecarinata RICHARDSON, Proc. Biol. Soc. Washington, XII, 1898, pp. 39, 40.

Habitat.—Off Little Bahama Bank; between delta of the Mississippi and Cedar Keys, Florida.

Depth.—88 to 338 fathoms.

53. ÆGA CRENULATA Lütken.

Æga crenulata LÜTKEN, Vid. Medd. Naturh. Foren. i Kjobhavn f. 1858, p. 70, pl. A, figs. 4, 5.—SCHIŒDTE and MEINERT, Nat. Tidsskr. (3), XII, p. 343, pl. VII, figs. 6–9.—HANSEN, Vid. Medd. Naturh. Foren. i Kjobenkavn f. 1887, p. 183.

Habitat.—Ritenbenk and Umanek, West Greenland; also Iceland, Finmark, coast of Norway.

54. ÆGA WEBBII (Guérin).

Pterelas webbii Guérin, Mag. Zool., Cl. VII, 1836, pl. xx, figs. 1a–e.
Æga webbii Schiœdte and Meinert, Naturh. Tidssk., XII, 1879–80, pp. 347, 348, pl. x, figs. 1–4.
?*Æga webbii* Harger, Bull. Mus. Comp. Zool., Harvard College, 1883, XI, No. 4, p. 95.

Habitat.—Off Fernandina, Florida; lat. N. 31° 57′, long. W. 78° 18′ 35″ (Harger); also Cape of Good Hope; Portugal.

Depth.—333 fathoms.

55. ÆGA TENUIPES Schiœdte and Meinert.

Æga tenuipes Schiœdte and Meinert, Naturhistorisk Tidsskrift, XII, 1879–80, p. 371, pl. IX, fig. 4–6.

Habitat.—Cuba.

56. ÆGA DENTATA Schiœdte and Meinert.

Æga dentata Schiœdte and Meinert, Naturhistorisk Tidsskrift, XII, 1879–80, pp. 372, 373, pl. x, fig. 11–12.

Habitat.—Cuba.

57. ÆGA INCISA Schiœdte and Meinert.

Æga incisa Schiœdte and Meinert, Naturhistorisk Tidsskrift, XII, 1879–80, pp. 373, 374, pl. x, fig. 13–15.—Harger, Bull. Mus. Comp. Zool., Harvard College, X, 1883, No. 4, p. 96, pl. III, fig. 1.

Habitat.—Off Fernandina, Florida; off Georgia; off St. Augustine, Florida; 31° 57′ N. lat., 78° 18′ 35″ W. long.

Depth.—263 to 440 fathoms.

58. ÆGA ARCTICA Lütken.

Æga arctica Lütken, Vid. Medd. Nat. For., 1858, p. 71, pl. I A, figs. 1–3.—Schiœdte and Meinert, Naturhistorisk Tidsskrift, XII, 1879–80, pp. 374, 375.

Habitat.—Umanek and Hundeöerne, near Egedesminde, Greenland; also Iceland and Finmark.

59. ÆGA VENTROSA M. Sars.

Æga ventrosa M. Sars, Chr. Vid. Selsk. Forh., 1848, p. 156.
Æga loveni Bovallius, Bihang Sv. Ak. Handl., XI, No. 16, pp. 3–6, pl. I, figs. 1–10.
Ægiochus ventrosus (M. Sars) Bovallius, Bihang. Sv. Ak. Handl., XI., No. 16, pp. 8–9.
Ægiochus nordenskioldii Bovallius, Bihang Sv. Vet. Akad. Handl., X, 1885, No. 9, p. 5, pl. I–XI.
Æga nordenskioldii (Bovallius) Hansen, Vidensk Meddel. naturh. Foren. i Kjoebh., 1887, pp. 184–187.
Æga ventrosa G. O. Sars, Crust. of Norway, II, 1897, Pts. 3, 4, p. 64, pl. XXVI, fig. 3.

Habitat.—Greenland; also coast of Norway; Finland.

Depth.—120 fathoms.

60. ÆGA GRACILIPES Hansen.

Æga gracilipes HANSEN, Isopoden, Cumaceen und Stomatopoden der Plankton Exp., 1895, pp. 15, 16, pl. I, fig. 6–6c.

Habitat.—Gulf of Mexico; North Atlantic, 59,0° N. lat., 8,5° W. long.

Depth.—730 fathoms; 1,524 meters (Hansen).

23. ROCINELA Leach.

ANALYTICAL KEY TO THE SPECIES OF ROCINELA.

a. Eyes contiguous. Head produced into process in front.
61. *Rocinela oculata* Harger.

a'. Eyes not contiguous.
  b. Flagellum of second pair of antennæ with fourteen to sixteen joints.
    c. Eyes close together. Head without median excavation, not bicarinated.
62. *Rocinela insularis* Schiœdte and Meinert.
    c'. Eyes widely separated. Propodus of prehensile legs with two to four spines. First thoracic segment normal.
      d. Frontal margin of head produced.
        e. Head tuberculated.................... 63. *Rocinela cubensis* Richardson.
        e'. Head not tuberculated. With frontal excavation. Front bicarinated.
64. *Rocinela dumerilii* (Lucas).
      d'. Frontal margin of head not produced. Terminal segment of body linguate; both branches of the uropoda crenulate on their external margins.
        e. Spots present on both sides of the fourth thoracic segment.
65. *Rocinela maculata* Schiœdte and Meinert.
        e'. Spots wanting on fourth thoracic segment. Spots wanting on fourth and fifth abdominal segments and terminal segment.
66. *Rocinela americana* Schiœdte and Meinert.
  b'. Flagellum of second pair of antennæ with ten or eleven joints. No tubercles developed on body. Terminal segment of body ornamented with a pair of narrow semilunar bands, separated by a longitudinal stripe.
67. *Rocinela signata* Schiœdte and Meinert.

61. ROCINELA OCULATA Harger.

Rocinela oculata HARGER, Bull. Mus. Comp. Zool., Harvard College, IX, No. 4, pp. 97–99, pl. III, fig. 2–2a; pl. IV, fig. 1.

Habitat.—32° 18′ 20″ W. lat., 78° 43′ W. long.

Depth.—252 fathoms.

62. ROCINELA INSULARIS Schiœdte and Meinert.

Rocinela insularis SCHIŒDTE and MEINERT, Naturhistorisk Tidsskrift, 1879–80, XII, pp. 390, 391, pl. XII, fig. 1–3.

Habitat.—West Indies; between delta of the Mississippi and Cedar Keys, Florida; off Fernandina, Florida.

Depth.—227 to 273 fathoms.

63. ROCINELA CUBENSIS Richardson.

Rocinela cubensis RICHARDSON, Proc. Amer. Phil. Soc., XXXVII, 1898, pp. 13, 14.

Habitat.—Off Habana.

Depth.—143 fathoms.

64. ROCINELA DUMERILII Lucas.

Acherusia dumerilii Lucas, Expl. Sc. Algér., Zool. I, p. 79, pl. viii, fig. 3.
Acherusia complanata Grube, Ins. Lussin Meeresf., p. 76.
Rocinela dumerilii Schiœdte and Meinert, Naturhistorisk Tidsskrift, XII, pp. 391–393, pl. xii, fig. 4–6.

Habitat.—Off Habana, Cuba; also Mediterranean Sea; Adriatic Sea; in Atlantic Ocean, 36° 46′ 7″ lat. N., 14° 7′ 2″ long. W.
Depth.—220 fathoms.

65. ROCINELA MACULATA Schiœdte and Meinert.

Rocinela maculata Schiœdte and Meinert, Naturhistorisk Tidsskrift (3), XII, 1879, p. 393, pl. xii, figs. 10–12.—Bovallius, Bihang t. Kgl. Sv. Vet. Akad. Handlingar, X, No. 11, p. 10, pl. ii, figs. 18–23.—Hansen, Vidensk. Meddel. naturh. Foren. i Kjoebh., 1887, p. 187.

Habitat.—Greenland; Vladivostock; east Asia.

66. ROCINELA AMERICANA Schiœdte and Meinert.

Rocinela americana Schiœdte and Meinert, Naturhistorisk Tidsskrift, XVI, 1879–80, pp. 394, 395, pl. xii, figs. 16–18.—Harger, Bull. Mus. Comp. Zool., Harvard College, XI, 1883, No. 4, pp. 98, 99, pl. iv, figs. 3, 3a, 4; pl. iv, figs. 2, 2a.

Habitat.—Trenton, Maine; 40° 2′ 54″ N. lat., 70° 23′ 40″ W. long.; 40° N. lat., 70° 57′ W. long.; 39° 57′ N. lat., 70° 57′ 30″ W. long.; 37° 25′ N. lat., 74° 18′ W. long.; 40° 2′ N. lat., 70° 37′ 30″ W. long.
Depth.—85 to 157 fathoms.

67. ROCINELA SIGNATA Schiœdte and Meinert.

Rocinela signata Schiœdte and Meinert, Naturhistorisk Tidsskrift, XII, 1879–80, pp. 399–401, pl. xiii, fig. 3–6.

Habitat.—West Indies; shores of Central America; St. Croix Island; St. Bartholomew Island; Marco, No Name Key, and between Delta of the Mississippi and Cedar Keys, Florida.
Depth.—Low water to 26 fathoms.

24. SYSCENUS Harger.

68. SYSCENUS INFELIX Harger.

Syscenus infelix Harger, Report U. S. Fish Comm., Pt. 6, pp. 387–390, 1880; Bull. Mus. Comp. Zool., Harvard College, XI, 1883, No. 4, pp. 100–102, pl. iii, figs. 5–5a, pl. iv, figs. 3–3h.

Habitat.—41° 34′ 30″ N. lat., 65° 54′ 30″ W. long.; 40° 11′ 40″ N. lat., 68° 22′ W. long.; Marthas Vineyard; south of Long Island; also all along the Atlantic coast as far south as Delaware Bay.
Depth.—231 to 435 fathoms.

Family IX. CYMOTHOIDÆ.

ANALYTICAL KEY TO THE GENERA OF CYMOTHOIDÆ.[1]

a. Head not at all immersed or set in the first thoracic segment.

  b. Uropoda and terminal segment ciliated. Eyes large, conspicuous..25. *Ægathoa*.

  b′. Uropoda and terminal segment not ciliated. Eyes small.

    c. Posterior angles of first segment of body prominent or produced, very often acute; posterior angles of the following segments increasing gradually in length, the first of these very often scarcely prominent, the posterior ones very often produced, abruptly longer than the first. Epimera of the first segments extending beyond the posterior angles of the segment; posterior ones produced, acute .... 26. *Nerocila*.

    c′. Posterior angles of first six segments of body scarcely or not at all prominent, those of seventh segment produced. Epimera of first segments very often almost or quite reaching, or not reaching by a short distance, the posterior angle of the segment.

      d. Body compact. Head not constricted at base. Uropoda very often more or less longer than terminal segment. Legs gradually increasing in length. 27. *Anilocra*.

      d′. Body relaxed. Head constricted at the base. Uropoda much shorter than terminal segment. Legs gradually and much longer successively; seventh pair abruptly very much so...................... 28. *Olencira*.

a′. Head more or less immersed or set in first thoracic segment.

  b. First pair of antennæ contiguous at the base.

    c. Epimera of the first pair with a carina produced in the form of a spoon in female. Ungulæ very long, unequal in length; those of the third pair longest, abruptly longer than second pair. Terminal segment transverse.. 29. *Ceratothoa*.

    c′. Epimera of the first pair not produced in female. Ungulæ mostly very short, very rarely long, equal in length. Terminal segment subtriangular, semicircular, often bilobed .... 30. *Meinertia*.

  b′. First pair of antennæ manifestly distant at the base.

    c. Abdomen manifestly separated from the thorax, abruptly narrower than thorax.. 31. *Cymothoa*.

    c′. Abdomen continuous with thorax, not narrower than thorax.

      d. Body hunched or compressed .... 32. *Agarna*.

      d′. Body evenly convex, not hunched.

        e. Abdomen very little or scarcely immersed. Segments of thorax either equal in length or the first segment abruptly longer and the last segment abruptly shorter than the others......................... 33. *Livoneca*.

        e′. Abdomen very deeply and profoundly immersed. First segment of the thorax manifestly longer than the second; six posterior segments gradually decreasing a little in length .... 34. *Irona*.

25. ÆGATHOA Dana.

ANALYTICAL KEY TO THE SPECIES OF ÆGATHOA.

a. Frontal margin of head produced anteriorly in a median linguate projection. 69. *Ægathoa linguifrons*, new species.

a′. Frontal margin of head not produced anteriorly in a median projection.

  b. Surface of head smooth, evenly convex. Second pair of antennæ ten-jointed. First thoracic segment longer than any of the succeeding segments, which are of equal length.......................... 70. *Ægathoa loliginea* Harger.

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[1] The definitions of genera are taken from Schiœdte and Meinert's Monograph of the Cymothoidæ, Naturhist. Tidssk., XIII, XIV, 1881-1884.

[illegible] lateral portion. [illegible] Second pair of antennæ [illegible] subequal and [illegible] Richardson.

69. ÆGATHOA LINGUIFRONS, new species.

Body narrow, elongated and abdomen not narrower than thorax.

Head with sides rounded. Frontal margin abruptly produced anteriorly into a median linguate projection with apex rounded; posterior part of projection forming a raised surface sharply defined from anterior part of head, extending back to eyes. Eyes large, oval, occupying two-thirds the width of head. First pair of antennæ nine-jointed. Second pair more slender, equal in length to first pair, and ten-jointed.

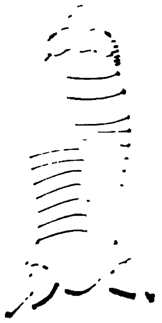
FIG. [illegible].—ÆGATHOA LINGUIFRONS.

First three thoracic segments long, second one shortest; last four segments short, of nearly equal length. All the abdominal segments distinct; first five equal in length, terminal segment rounded at apex. Uropoda longer than terminal segment. Inner branch obliquely truncate at apex and shorter than outer branch, which is obtusely pointed.

Both branches, as well as the posterior margin of the terminal segment, are fringed with hairs.

Legs similar in structure, with curved dactyli.

Color, light brown, with scattered black dots.

A single specimen was obtained at Trinidad.

Type.—Cat. No. 23903, U.S.N.M.

70. ÆGATHOA LOLIGINEA Harger.

? *Cymothoa oculata* SAY, Jour. Ac. Nat. Sci. Phil., I, 1818, pp. 398, 399.

Ægathoa loliginea HARGER, Am. Jour. Sci., XV, 1898, p. 376; Proc. U. S. Nat. Mus., II, 1879, p. 161. Report U. S. Commissioner of Fish and Fisheries, 1880, Pt. 6, pp. 393, 394, pl. x, fig. 66.

Habitat.—Savin Rock, near New Haven, Connecticut; Fort Macon, North Carolina; St. Johns River, Florida (Say).

Cymothoa oculata Say is probably identical with *Ægathoa loliginea* Harger. In the description given by Say, the characters which point to this identification are "body elongate oval; head trilobate behind, middle lobe smallest; abdomen, segments not shorter than terminal thoracic ones; tail, terminal segment shorter than the four preceding segments conjunctly. Lateral line of body forming a perfectly uninterrupted curve; head regularly rounded before, broader than long; eyes large, conspicuous, fascets regularly hexagonal; terminal segment hardly broader than preceding segment, rounded at tip, edge ciliate, nearly equal to length of the four preceding joints conjunctly. Uropoda ciliated."

Say's species is clearly not a *Cymothoa*, and can be placed with no other genus of the *Cymothoidæ* than *Ægathoa*, because of the ciliated uropoda and ciliated terminal abdominal segment.

Although nothing is said of the antennæ in the meager description, the species can hardly be placed among the *Ægidæ*, because of the long abdominal segments which are equal in length to the posterior thoracic segments, the head trilobate behind, regularly rounded before, and terminal segment hardly broader than preceding segment.

71. ÆGATHOA MEDIALIS Richardson.

Ægathoa medialis RICHARDSON, Am. Nat., XXXIV, 1900, p. 220.

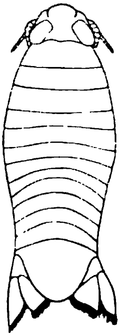

FIG. 11.—ÆGATHOA MEDIALIS.

Body narrow, elongate; abdomen not narrower than thorax.

Head, with anterior margin, broadly rounded in front; central portion sharply raised above lateral portion, which is deeply excavate just in front of eyes. Eyes large, occupying two-thirds the width of the head. First pair of antennæ eight-jointed; second pair more slender, equal in length, and nine-jointed.

First three segments of thorax subequal, last four subequal and somewhat shorter than first three. First five abdominal segments equal in length. Terminal segment rounded posteriorly. Uropoda longer than terminal segment; branches unequal. Outer branch the longer; inner branch obliquely truncate. Legs similar in structure, with curved dactyli. Color, light brown, densely covered with black spots. Single specimen from Barren Island, Chesapeake Bay.

Depth.—3 to 25 fathoms.

Type.—Cat. No. 23904, U.S.N.M.

26. NEROCILA Leach.

ANALYTICAL KEY TO THE SPECIES OF NEROCILA.

a. Head rounded like a circle in front; eyes indistinct, obscure. Terminal segment cordate, acuminate, lightly carinated. Uropoda scarcely longer than the terminal segment; inner branch much shorter and wider than outer branch, acuminate; outer branch narrow, scythe-shaped.
72. *Nerocila acuminata* Schiœdte and Meinert.

a'. Head subtruncate in front. Eyes distinct, black. Terminal segment regularly rounded, not carinated. Uropoda much longer than terminal segment; inner branch narrowly oval, obliquely truncate, and shorter than outer branch; outer branch narrowly ovate or lanceolate....... 73. *Nerocila munda* Harger.

72. NEROCILA ACUMINATA Schiœdte and Meinert.

Nerocila acuminata SCHIŒDTE AND MEINERT, Naturhistorisk Tidsskrift, XIII, 1881–1883, pp. 48–50, pl. III, figs. 5–6.

Habitat.—Atlantic Ocean and Gulf of Mexico; St. Anna, Mexico; Louisiana; Pensacola and St. Marys River, Florida; Fort Macon, North Carolina; New Point, Virginia.

73. NEROCILA MUNDA Harger.

Nerocila munda HARGER, Report U. S. Commissioner of Fish and Fisheries, 1874, Pt. 1, p. 571 (277); Proc. U. S. Nat. Mus., II, 1879, p. 161.—VERRILL, Report U. S. Commissioner of Fish and Fisheries, 1874, Pt. 1, p. 459 (165).—HARGER, Report U. S. Commissioner of Fish and Fisheries, 1880, Pt. 6, pp. 392, 393, pl. x, fig. 65.

Habitat.—Vineyard Sound.

27. ANILOCRA[1] Leach.

ANALYTICAL KEY TO THE SPECIES OF ANILOCRA.

a. Head produced, with sides sinuate and roundly truncate in front. Terminal abdominal segment varying in width, either equally as long as wide, or manifestly longer than wide. Uropoda much shorter than caudal segment; inner branch scarcely much longer and much wider than outer branch.
74. *Anilocra laticauda* Milne-Edwards.

a'. Head rounded as a circle in front. Terminal abdominal segment wider than long. Uropoda manifestly longer than terminal segment; inner branch much shorter and scarcely wider than outer branch.
75. *Anilocra plebeia* Schiœdte and Meinert.

74. ANILOCRA LATICAUDA Milne-Edwards.

Anilocra laticauda MILNE-EDWARDS, Hist. Nat. Crust., III, p. 259.

Anilocra mexicana SAUSSURE, Rev. Mag. Zool., 1857, p. 505.

Anilocra leachii (KRØYER), SCHIŒDTE, Natur. Tidsskr., IV, 1866, p. 205, pl. XI, figs. 2a–2g.

Anilocra laticauda SCHIŒDTE and MEINERT, Naturhistorisk Tidsskrift, XIII, 1881–1883, pp. 126–131, pl. IX, figs. 1–3.

Habitat.—From Maryland to Straits of Magellan: Maryland; Key West; St. Anna, Mexico; Cozumel, Yucatan; Habana, Cuba; St. Thomas; St. Croix; St. Bartholomew; Rio de Janeiro, Brazil; Sandy Point, in Straits of Magellan; Porlamar, Margarita Island, Venezuela.

75. ANILOCRA PLEBEIA Schiœdte and Meinert.

Anilocra plebeia SCHIŒDTE and MEINERT, Naturhistorisk Tidsskrift, XIII, 1881–1883, pp. 145, 146, pl. x, fig. 3.

Habitat.—Shores of Costa Rica, Central America.

28. OLENCIRA Leach.

76. OLENCIRA PRÆGUSTATOR (Latrobe).

Oniscus prægustator LATROBE, Trans. Amer. Philos. Soc., V, p. 77, pl. I.

Cymothoa prægustator SAY, Jour. Ac. Nat. Sci. Phila., I, 1818, pp. 395, 396.

Olencira lamarckii LEACH, Dict. Sc. Nat., XII, p. 351.—DESMAREST, Consid. Gen. Crust., p. 307.—MILNE-EDWARDS, Hist. Nat. Crust., III, p. 264.

Olencira prægustator SCHIŒDTE and MEINERT, Naturh. Tidsskrift, XIII, 1881–1883, pp. 152–154, pl. x, figs. 6–9.

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[1] The species described by Nicholson in his Hist. Nat. de St. Dominique, pp. 343, 344, pl. VII, fig. 2, under the name of *Pou de Sarde*, and which he speaks of as "le véritable *Pediculus marinus* de Rondelet et Marcgrave," probably belongs to

Habitat.—Potomac River; York Spit, Virginia; Dividing Cove; St. Georges Island, Maryland; Fort Monroe, Head of Cockrell Creek, Hampton Creek, Lower Chesapeake Bay; Cape Charles, Virginia; off Great Wicomico; Pensacola and St. Marys River, Florida.

29. CERATOTHOA Dana.

77. CERATOTHOA LINEARIS Dana.

Ceratothoa linearis DANA, U. S. Explor. Exped. Crust., II, p. 752, pl. L, fig. 1 a–1 d.

? *Cymothoa impressa* SAY, Jour. Ac. Nat. Sci. Phil., I, 1818, p. 397.

Ceratothoa exocœti CUNNINGHAM, Trans. Linn. Soc. London, XXVII, p. 499, pl. LIX, fig. 5.

Glossobius linearis SCHIŒDTE and MEINERT, Naturhistorisk Tidsskrift, XIII, 1881–1883, pp. 301–308, pl. XII, fig. 1–2.

Ceratothoa linearis STEBBING, Hist. of Crust., 1893, p. 354.

Habitat.—From 42° to 21° N. lat.; 8° to 10° N. lat., 40° to 50° W. long.; 34° N. lat., 51° W. long.; Rio Janeiro; in the Gulf Stream everywhere; Cape May, New Jersey (Say).

30. MEINERTIA Stebbing.

78. MEINERTIA TRANSVERSA Richardson.

Meinertia transversa Richardson, Am. Nat., XXXIV, 1900, p. 221.

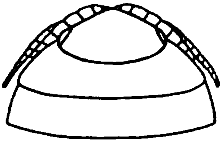

FIG. 12.—HEAD OF MEINERTIA TRANSVERSA.

Head very little immersed in first thoracic segment, large, subtriangular, anterior margin pointed with sides slightly sinuate. Eyes situated at extreme post-lateral margins, almost obscure. First pair of antennæ, with joints dilated, issuing close together, eight articulate. Second pair of antennæ slender, extending a little beyond posterior margin of first thoracic segment; fourteen jointed.

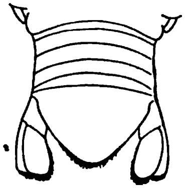

FIG. 13.—ABDOMEN OF MEINERTIA TRANSVERSA.

Thoracic segments subequal in length.

Abdomen not at all immersed. All the segments visible and equal in width and length. Terminal segment subtriangular with apex round, impressed at base, equal in length to first five segments taken together. Uropoda a little longer than apex of terminal segment, branches similar in shape, oar-like, and of equal length.

Legs increasing in length from first to seventh pair.

Color yellowish brown.

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the genus *Anilocra*. Schiœdte and Meinert have placed *Pediculus marinus* Rondelet in the synonymy of *Anilocra physodes* Linnæus, and following their authority, and Nicholson's observation on the close resemblance of his species with *Pediculus marinus*, I would refer *Pou de Sarde* to this genus. Whether or not it is identical with *A. laticauda*, common in the West Indies, I am unable to determine from the description.

One specimen from between the delta of the Mississippi and Cedar Keys, Florida, collected by the U. S. Fish Commission steamer *Albatross*.

Type.—No. 9728, U.S.N.M.

31. CYMOTHOA Fabricius.

ANALYTICAL KEY TO THE SPECIES OF CYMOTHOA.

a. Terminal segment lanceolate .... 79. *Cymothoa lanceolata* Say.

a'. Terminal segment transverse; posterior margin widely sinuated or bilobed.

b. Anterior angles of the first thoracic segment short, acute; sides of the segment a little constricted. Inner branch of the uropoda much shorter than outer branch .... 80. *Cymothoa excisa* Perty.

b'. Anterior angles of the first thoracic segment very large, equaling or surpassing the front of the head, rounded; sides of the segment flexuous. Inner branch of the uropoda manifestly longer that outer branch.
81. *Cymothoa œstrum* (Linnæus).

79. CYMOTHOA LANCEOLATA Say.

Cymothoa lanceolata Say, Jour. Acad. Nat. Sci. Phila., I, 1818, pp. 397, 398.

Habitat.—Cumberland Island, Georgia.

80. CYMOTHOA EXCISA Perty.

Cymothoa excisa Perty, Del Amin., p. 211.

Cymothoa parasita Saussure, Mém. Soc. Phys. Genève, XIV, Pt. 2, p. 485, pl. v, fig. 44.

Crustaceum quoddam animalculum Acarapitambam vexans Marcgrav, Hist. pisc. IV, p. 155.

Cymothoa excisa Schiœdte and Meinert, Naturhistorisk Tidsskrift, XIV, 1883-84, pp. 238–244, pl. vi, figs. 11–16. (See Schiœdte and Meinert for synonymy.)

Habitat.—Massachusetts; Florida Reefs; Charlestown Harbor, South Carolina; Bahamas; Biloxi, Mississippi; Cuba; Maranhao; Rio Janeiro.

81. CYMOTHOA ŒSTRUM (Linnæus).

Oniscus œstrum Linnæus, Syst. Nat., 10th ed., I, p. 636, No. 2; Fauna Su., 2d ed., p. 499, no. 2053; Syst. Nat., 12th ed., I, Pt. 2, p. 1059, No. 2.

Asellus œstrum Olivier, Encycl. méthod, IV, p. 253.

Cymothoa œstrum Fabricius, Entom. Syst. II, p. 505, No. 6.—Leach, Trans. Linn. Soc., XI, p. 372; Dict. Sc. Nat., XII, p. 352.—Desmarest, Consid. gén. Crust., p. 309, pl. xlvii, figs. 6–7.

Cymothoa dufresnei Leach, Dict. Sc. Nat., XII, p. 352.

Cymothoa immersa Say, Journ. Ac. Nat. Sc. Phila., I, 1818, pp. 399, 400.

Cymothoa œstrum Schiœdte and Meinert, Naturhistorisk Tidsskrift, XIV, 1883-84, pp. 271–279, pl. viii, figs. 5–13.

Habitat.—Caribbean Sea and Gulf of Mexico to shores of Virginia: Swan Island; St. Bartholomew; St. Christopher; Jamaica; Guadeloupe; St. Anna, Mexico; Key West, Florida; Curacao, Venezuela.

32. AGARNA Schiœdte and Meinert.

82. AGARNA CARINATA Schiœdte and Meinert.

Agarna carinata Schiœdte and Meinert, Naturhistorisk Tidsskrift, XIV, 1883–84, pp. 329–334, pl. XIII, figs. 1–3.

Habitat.—St. Croix Island, West Indies; Key West, Florida.

33. LIVONECA Leach.

ANALYTICAL KEY TO THE SPECIES OF LIVONECA.

a. Uropoda much longer than caudal segment; inner branch narrow, obtuse, much shorter than outer branch. Epimera of last two thoracic segments not longer than segments .... 83. *Livoneca redmanni* Leach.

a′. Uropoda hardly surpassing the caudal segment; both branches equal in length, inner one oval. Epimera of last two thoracic segments longer than segments. 84. *Livoneca ovalis* (Say).

83. LIVONECA REDMANNI Leach.

Livoneca redmanni Leach, Dict. Hist. Nat., XII, p. 352.—Desmarest, Cons. Gén. Crust., p. 308.—Milne-Edwards, Hist. Nat. Crust., III, p. 261; Cuv. Règn. Anim. Ill., pl. LXVI, figs. 4, 4a.

Livoneca desmarestii Leach, Dict. Hist. Nat., XII, p. 352.—Desmarest, Cons. Gén. Crust., p. 308.—Milne-Edwards, Hist. Nat. Crust., III, p. 261; Cuv. Règn. Anim. Ill., pl. LXVI, figs. 3, 3a–3e.

Livoneca redmanni Schiœdte and Meinert, Naturhistorisk Tidsskrift, XIV, 1883–84, p. 353–358, pl. XIV, figs. 6–12.

Habitat.—New York; Charleston, South Carolina; Mobile, Alabama; Biloxi, Mississippi; Cuba; St. Christopher; Jamaica; Bahia, and Rio Janeiro, Brazil.

84. LIVONECA OVALIS (Say).

Cymothoa ovalis Say, Jour. Acad. Nat. Sci. Phila., I, 1818, p. 394.

Cymothoa triloba Dekay, Nat. Hist. N. Y., Pt. 1, p. 46, pl. X, fig. 40, 1843.

(?) *Cymothoa olivacea* Dekay, Nat. Hist., N. Y., Pt. 1, p. 47, pl. X, figs. 41, 41a.

Livoneca ovalis White, Cat. Crust. Brit. Mus., 1847, p. 109.—Harger, Report U. S. Commissioner of Fish and Fisheries, 1874, Pt. 1, p. 572 (278), pl. VI, fig. 29; Proc. U. S. Nat. Mus., II, 1879, p. 162; Report U. S. Commissioner of Fish and Fisheries, 1880, Pt. 6, pp. 395, 396, pl. XI, fig. 67.

Habitat.—New Haven; Thimble Islands; Long Island Sound; Woods Hole, Massachusetts; Vineyard Sound; New York; Patapsco River; Charleston, South Carolina; Pensacola, Florida; St. Marys River, Florida.

34. IRONA Schiœdte and Meinert.

85. IRONA NANA Schiœdte and Meinert.

Irona nana Schiœdte and Meinert, Naturhistorisk Tidsskrift, XIV, 1883–84, pp. 390–395, pl. XVII, figs. 6–11.

Habitat.—Caribbean Sea and Atlantic Ocean; St. John; St. Bartholomew; Rio Janeiro.

Family X. LIMNORIIDÆ.

35. LIMNORIA Leach.

86. LIMNORIA LIGNORUM (Rathke).

Cymothoa lignorum RATHKE, Skrivt. of Naturh. Selsk., V, 1799, p. 101, pl. III, fig. 14 (White).

Limnoria terebrans LEACH, Ed. Encycl., VII, 1813, p. 433 (Am. ed., p. 273); Trans. Linn. Soc., XI, 1815, p. 37; Dict. Sci. Nat., XII, 1818, p. 353.—DESMAREST, Consid. Crust., 1825, p. 312.—LATREILLE, Règne Anim., IV, 1829, p. 135.—EDWARDS, Annot. de Lamarck, V, 1838, p. 276; Hist. Nat. des. Crust., III, 1840, p. 145; Régne Anim., Crust., 1849, p. 197, pl. LXVII, fig. 5.—GOULD, Invert. Mass., 1840, pp. 338, 354.—VERRILL, Proc. Am. Assoc., 1873 (1874), p. 367.

Limnoria lignorum WHITE, Pop. Hist. Brit. Crust., 1857, p. 227, pl. XII, fig. 5.—BATE, Rep. Brit. Assoc., 1860 (1861), p. 225.—BATE and WESTWOOD, Brit. Sess. Crust., II, 1868, p. 351.—NORMAN, Rep. Brit. Assoc., 1868 (1869) p. 288.—VERRILL, Am. Journ. Sci., VII, 1874, pp. 133, 135; Proc. Am. Assoc., 1873 (1874), p. 371; Report U. S. Com. of Fish and Fisheries, 1874, Pt. 1, p. 379 (85).—HARGER, Report U. S. Fish Com. 1874, Pt. 1, p. 571 (277) pl. VI, fig. 25; Proc. U. S. Nat. Mus., II, 1879, p. 161.—STEBBING, Trans. Devon. Assoc., 1874, p. 8; Ann. Mag. Nat. Hist., 4th ser., XVII, 1876, p. 79.—SMITH, Proc. U. S. Nat. Mus., II, 1879 (1880), p. 232, fig. 2.

Limnoria uncinata HELLER, Verh. k. k. Zool. Bot. Ges. Wien, XVI, 1866, p. 734.

Limnoria lignorum HARGER, Report U. S. Fish Commissioner, 1880, Pt. 6, pp. 373, 376 (see Harger for synonymy).

Limnoria californica HEWSTON, Proc. Cal. Acad. Sci., V, 1874, p. 24 (nomen nudum).

Habitat.—From Florida to Halifax, and Gulf of St. Lawrence; also coast of Great Britain; North Sea; Adriatic Sea; Pacific Ocean; California; coast of Norway.

Family XI. SPHÆROMIDÆ.

ANALYTICAL KEY TO THE GENERA OF SPHÆROMIDÆ.

a. Outer branch of the uropoda small, almost rudimentary .... 36. *Cassidina.*
a'. Outer branch of the uropoda not rudimentary.
  b. Both external and internal branches of the uropoda projecting and exposed; outer branch capable of folding under inner.
    c. Terminal segment of the abdomen entire .... 37. *Sphæroma.*
    c'. Terminal segment excavated at its extremity .... 38. *Dynamene.*
  b'. Only external branch of the uropoda projecting and exposed; outer branch incapable of folding under inner.
    c. All the thoracic segments of equal length. Penultimate abdominal segment in male generally produced in spine. Terminal segment excavate with or without median lobe .... 39. *Cilicæa.*
    c'. Sixth segment of the thorax much enlarged, and produced at the center far backward, covering the shorter seventh segment for the most part. Terminal segment excavate .... 40. *Næsa.*

36. CASSIDINA Milne Edwards.

87. CASSIDINA LUNIFRONS Richardson.

Cassidina lunifrons RICHARDSON, Am. Nat., XXXIV, 1900, p. 222.

Body oval, surface smooth.

Head broader anteriorly than posteriorly, the antero-lateral angles being produced in a lateral direction and forming very acute angles. The eyes are situated at the post-lateral corners of the head. The first pair of antennæ reach two or three joints beyond the antero-lateral angle of the head; flagellum five-jointed. The second pair almost reach the posterior margin of the first thoracic segment; flagellum contains about eight joints, the first four being large, the last four small and setose.

The first thoracic segment is well fitted to the head, so that the elliptical outline of the body is preserved. The segments are subequal, with straight lateral margins. The epimera are hardly distinct from the segments.

The first segment of the abdomen is short. The terminal segment is subtriangular, with apex truncate. The inner branch of the uropoda is pointed at its extremity, and reaches the tip of the abdomen. The outer branch is rudimentary, about one-fourth as long as the inner branch.

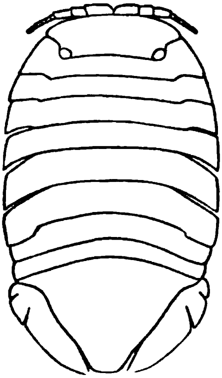
FIG. 14.—CASSIDINA LUNIFRONS.

Color, brown.

Specimens were found at Great Egg Harbor, New Jersey, by William Stimpson.

Type.—Cat. No. 4402, U.S.N.M.

37. SPHÆROMA Latreille.

ANALYTICAL KEY TO THE SPECIES OF SPHÆROMA.

a. Outer branch of the uropoda denticulate on its external margin.
  - *b*. Abdomen without tubercules.............. 88. *Sphæroma quadridentatum* Say.
  - *b'*. Abdomen with tubercules............... 89. *Sphæroma destructor* Richardson.

a'. Outer branch of the uropoda smooth on its external magin.
90. *Sphæroma yucatanum*, new species.

88. SPHÆROMA QUADRIDENTATUM Say.

Sphæroma quadridentatum SAY, Jour. Acad. Nat. Sci. Phila., I, 1818, p. 400.—HARGER, Am. Jour. Sci., V, 1873, p. 314; Report U. S. Commissioner of Fish and Fisheries, 1874, Pt. 1, p. 569 (275), pl. v, fig. 21; Proc. U. S. Nat. Mus., II, 1879, p. 161.—VERRILL, Report U. S. Commissioner of Fish and Fisheries, 1874, Pt. 1, p. 315 (21).—HARGER, Report U. S. Commissioner of Fish and Fisheries, 1880, Pt. 6, pp. 368–370, pl. IX, fig. 53.

Habitat.—Provincetown, Massachusetts; Cape Charles City, Virginia; St. Catherine's Island, Georgia; East Florida; Key West, Florida.

Depth.—Surface to one-half fathom.

89. SPHÆROMA DESTRUCTOR Richardson.

Sphræroma destructor RICHARDSON, Proc. Biol. Soc. Wash., XI, p. 105, 1897.

Habitat.—St. John's River, Palatka, Florida.

90. SPHÆROMA YUCATANUM, new species.

Head transverse; eyes situated at the extreme post-lateral angles. First pair of antennæ short, reaching the posterior margin of the head; flagellum six-jointed. Second pair of antennæ, with a flagellum containing ten joints, extends to the posterior margin of the second thoracic segment.

First thoracic segment longer than any of the following segments, its post-lateral angles produced. The remaining segments of equal length; epimera produced laterally into acute processes.

First abdominal segment with suture lines. Last segment terminating posteriorly in an obtuse point, on either side of which is a small tooth. The base of the segment bears three low tubercles, one on the median line and one on either side. The uropoda are short, not reaching the post-lateral teeth. Both branches are equal in length and width, the outer branch pointed, the inner branch truncate.

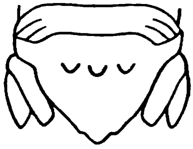
FIG. 15.—ABDOMEN OF SPHÆROMA YUCATANUM.

Surface of body smooth; color bluish.

One specimen was taken at Cape Catoche, Yucatan.

Type.—Cat. No. 23905, U.S.N.M.

38. DYNAMENE Leach.

ANALYTICAL KEY TO THE SPECIES OF DYNAMENE.

a. Terminal abdominal segment with only a slight rounded excavation at its extremity. Extremity of terminal segment and outer posterior angles of uropoda rounded, not produced.......... 91. *Dynamene bermudensis* (Ives).

a'. Terminal abdominal segment with a deep V shaped excavation at its extremity. Extremity of terminal segment and outer posterior angles of uropoda acutely produced...................... 92. *Dynamene angulata*, new species.

91. DYNAMENE BERMUDENSIS (Ives).

Cymodocea bermudensis IVES, Proc. Acad. Nat. Sci. Phila., 1891, p. 194.

Habitat.—Bermudas; Punta Rassa, Florida; Cedar Keys, Florida; Key West, Florida; No Name Key, Florida; Sarasota Bay, Florida; Beaufort, North Carolina.

92. DYNAMENE ANGULATA, new species.

Surface of body smooth; color yellow.

Head large, with small median point on its anterior margin. First pair of antennæ reach the posterior margin of the second thoracic segment; flagellum composed of nine joints. Second pair of antennæ reach the posterior margin of the fourth thoracic segment; flagellum composed of thirteen joints.

Thoracic segments sub-equal in length, the first being a little longer than any of the others. The epimera are broad and short, with acute lateral angulations.

The first abdominal segment bears suture lines indicative of coalesced segments. The terminal segment is sub-triangular, with the extremity produced and deeply excavate, the excavation being V shaped. The branches of the uropoda are similar in shape, the outer one being somewhat longer; they are obliquely truncated and do not quite reach the tip of the abdomen.

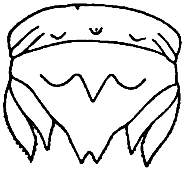
FIG. 16.—ABDOMEN OF DYNAMENE ANGULATA.

Specimens were found by Mr. Henry Hemphill at No Name Key, Florida.

Type.—Cat. No. 23906, U.S.N.M.

39. CILICÆA Leach.

ANALYTICAL KEY TO THE SPECIES OF CILICÆA.

a. Terminal abdominal segment with small sinus without teeth or median lobe.
93. *Cilicæa carinata* Richardson.

a'. Terminal abdominal segment with sinus in which are placed teeth or median lobe.
  b. Sinus with four teeth............................ 94. *Cilicæa caudata* (Say).
  b'. Sinus with one median lobe, projecting much beyond the lateral angles and triangulate at its extremity........... 95. *Cilicæa linguicauda*, new species.

93. CILICÆA CARINATA Richardson.

Cilicæa carinata RICHARDSON, Am. Nat., XXXIV, 1900, p. 224.

Head with a median projection on the anterior margin, produced forward in the form of a large tubercle. Eyes colorless. First pair of antennæ reach the posterior margin of the head; flagellum eight-jointed. Second pair of antennæ reach the posterior margin of the first thoracic segment.

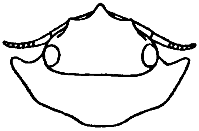
FIG. 17.—HEAD OF CILICÆA CARINATA.

The segments of the thorax are roughly granulated. A transverse median ridge or elevation appears on each of the segments, giving the dorsum, from a lateral view, a very rugged appearance. The epimera are rough and are drawn out laterally in very acute angles.

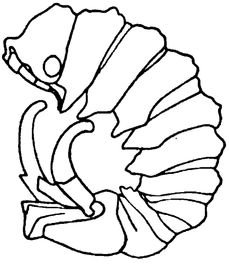
FIG. 18.—LATERAL VIEW OF CILICÆA CARINATA.

The abdomen is composed of two segments, the first segment being formed of several coalesced segments, as indicated by two suture lines. In the center of this segment are two longitudinal ridges, placed obliquely, so as almost to meet anteriorly and to spread apart at their other extremity. This segment projects down over the last segment at either side. The last segment bears a deep excavation at its posterior extremity, around and above which is a carinated ridge extending entirely around the whole of the posterior half of the segment. Two small longitudinal ridges are in the center of the segment. The inner branch of the uropoda is very short, not reaching the extremity of the abdomen by some distance; it is quadrangular in shape, with sides nearly parallel, and obliquely truncated at the end. The outer branch of the uropoda is long, curved, and pointed at the end, resembling a hook somewhat.

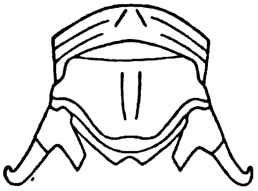

FIG. 19.—ABDOMEN OF CILICÆA CARINATA.

The color is a light yellow. In appearance the little isopod is very rough and rugged looking.

There is but one specimen, which was found off the coast of Georgia.

Depth.—440 fathoms.

Type.—Cat. No. 23907, U.S.N.M.

94. CILICÆA CAUDATA (Say).

Næsa caudata SAY, Jour. Acad. Nat. Sci., Phila., I, 1818, p. 482.—MILNE-EDWARDS, Hist. Nat. des Crustacés, III, p. 219.

Cymodocea caudata IVES, Proc. Acad. Nat. Sci., Phila., 1891, p. 188, pl. VI, figs. 11–14.

Cilicæa caudata RICHARDSON, Proc. U. S. Nat. Museum, XXI, p. 841 (footnote).

Habitat.—Egg Harbor, New Jersey; Beaufort, North Carolina; No Name Key, Florida; between Salt Pond Key and Stock Island; Key West, Sugarloaf Key, northwest end St. Martin's Reef, Sarasota Bay, Florida; off Progreso, Yucatan; Bermudas.

Depth.—Found on surface.

95. CILICÆA LINGUICAUDA, new species.

Head subtriangular in shape; frontal margin with a small median point; eyes post-laterally situated. The first pair of antennæ reach the posterior margin of the first thoracic segment; the second pair touch the fourth segment.

The first segment of the thorax is a little longer than any of the others, which are similar in size. The epimera are distinct from the segments, and are produced into acute points, with the exception of the last, which has the epimera quite rounded.

The abdomen is composed of two segments, the first of which gives indication of three coalesced segments, and has a small tooth on each side on its post-lateral margin. The last segment is swollen anteriorly, and bears three low tubercles on this portion. The extremity of the abdomen is marked by a sinus, which is almost completely filled by a single large tooth, which is posteriorly triangular and extends beyond the lateral teeth formed by the sinus. This central tooth bears a small, pointed tubercle near its base. The uropoda are slightly incurved, and are somewhat longer than the abdomen.

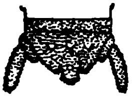

FIG. 20.—ABDOMEN OF CILICÆA LINGUICAUDA.

The color is a dull yellow.

The lower part of each thoracic segment is densely granulated, as well as the whole surface of the abdomen. The edges of the segments and the uropoda are fringed with hairs.

Habitat.—Cape Catoche, Yucatan.

Type.—Cat. No. 23908, U.S.N.M.

40. NÆSA Leach.

It is not probable that the two following species belong to the genus Næsa, but being unable from lack of specimens and from the character of the description to determine where they do belong, I have retained them for the present with Næsa where Say placed them.

96. NÆSA DEPRESSA Say.

Næsa depressa SAY, Jour. Ac. Nat. Sci. Phila., I, 1818, pp. 483, 484.

Habitat.—Egg Harbor, New Jersey.

Depth.—Found on surface.

97. NÆSA OVALIS Say.

Næsa ovalis SAY, Jour. Ac. Nat. Sci. Phila., I, 1818, pp. 484, 485.

Habitat.—St. Johns River, Florida.

Depth.—Found on surface.

III. VALVIFERA or IDOTEOIDEA.

ANALYTICAL KEY TO THE FAMILIES OF VALVIFERA.

a. Body more or less broad, depressed. Legs usually nearly alike, but first three pairs sometimes with propodus dilated and dactylus reflexed. Family XII. IDOTEIDÆ (p. 537).

a′. Body narrow, scarcely depressed. Four anterior pairs of legs unlike three posterior pairs, and not ambulatory, nor strictly prehensile, directed forward, slender, ciliated, with terminal joint minute; last three pairs stouter, ambulatory, with terminal joint bifid............Family XIII. ARCTURIDÆ (p. 545).

Family XII. IDOTEIDÆ.

ANALYTICAL KEY TO THE GENERA OF IDOTEIDÆ.

a. Sides of head emarginate or cleft and laterally produced beyond eyes, which are situated upon its dorsal surface. Three anterior pairs of legs, with penultimate joint or propodus dilated, and forming, with reflexible dactylus, a prehensile hand. All the epimera from the second to seventh segments distinctly defined.................................. 41. *Chiridotea.*

a'. Sides of head in a dorsal view entire and not laterally produced. Eyes lateral. Legs all ambulatory; three anterior pairs with penultimate joint not or not much dilated.

b. Flagellum of second pair of antennæ well developed and multiarticulate.

c. Palpus of maxillipeds four-jointed. Epimera of all the segments well developed and evident in a dorsal view. Abdomen consisting of three segments with lateral sutures indicative of another partially coalescent segment. 42. *Idotea*.

c'. Palpus of maxillipeds three-jointed. All the epimera coalesced and perfectly united with the segments. Abdomen consisting of one segment, uniarticulate.. 43. *Synidotea*.

b'. Flagellum of second pair of antennæ not multiarticulate.

c. Flagellum of second pair of antennæ obsolete. Second pair of antennæ much longer than first pair.

d. Legs subequal. Antennæ geniculate. Palp of maxillipeds four-jointed. Body angulate ....44. *Erichsonella*.

d'. Third and fourth pairs of legs generally markedly shorter than anterior pairs. Fifth, sixth, and seventh pairs gradually increasing in length. Antennæ not geniculate. Palp of maxillipeds two-jointed. Body slender, linear, smooth.. 45. *Cleantis*.

c'. Flagellum of second pair of antennæ rudimentary. Second pair of antennæ a little longer than first pair............................... 46. *Edotea*.

41. CHIRIDOTEA Harger.

ANALYTICAL KEY TO THE SPECIES OF CHIRIDOTEA.

a. Species large, elongate-ovate. Outer ramus of uropoda (opercular valves) minute. Joints of peduncle of antennæ greatly dilated; flagellum 7–8 jointed; anterocervical lobes prominent .... 98. *Chiridotea sabini* (Krøyer).

a'. Species small, orbiculate-ovate. Outer ramus of uropoda at least half as long as inner.

b. Antennæ little longer than antennules; flagellum seven-jointed. Eyes inconspicuous. Antennules longer than peduncle of antennæ. 99. *Chiridotea cæca* (Say).

b'. Antennæ twice as long as antennules; flagellum twelve-jointed. Eyes usually distinct. Antennules do not surpass peduncle of antennæ. 100. *Chiridotea tuftsii* (Stimpson).

98. CHIRIDOTEA SABINI (Krøyer).

Idotea sabini Krøyer, Nat. Tidsskr. (2), II, p. 401.—Reinhardt, Fortegnelse over Grönlands Krebsdyr, 1857, p. 34.—Lütken, List of Crust. of Greenland in Arctic Manual, 1875, p. 149.—Sars, Arch. f. Math. og Naturvidensk., II, 1877, p. 350.

Chiridotea megalura G. O. Sars, Archiv. f. Math. og Naturvidenskab., IV, 1880, p. 432.

Glyptonotus sabini Miers, Jour. Linn. Soc. Lond., XVI, 1883, p. 15–17, pl. I, fig. 3–5.—Axel Ohlin, Bidrag till kännedomen om Malakostrakfaunan i Baffin Bay och Smith Sound, 1895, p. 13–14.—Richardson, Proc. U. S. Nat. Mus., XXI, 1899, p. 844.

Chiridotea sabini Stebbing, Ann. Mag. Nat. Hist. (7), V, 1900, p. 14.

Habitat.—Davis Straits; Repulse Bay, North America; Cape Dudley Digges; Cape Faraday; 73° 43′ N. lat., 78° 48′ W. long.; 71° 57′ N.

lat., 73° 56′ W. long.; 71° 42′ N. lat., 73° W. long.; 66° 33′ N. lat., 61° 50′ W. long.; circumpolar.

Depth.—Surface to 25 fathoms.

99. CHIRIDOTEA CŒCA (Say).

Idotea cœca SAY, Jour. Acad. Nat. Sci. Phil., I, 1818, p. 424.—MILNE-EDWARDS, Hist. nat. des Crust., III, 1840, p. 131.—GUÉRIN, Iconog., Crust., 1843, p. 35.—VERRILL, Report U. S. Commissioner of Fish and Fisheries, 1874, Pt. 1.—HARGER, Report U. S. Commissioner of Fish and Fisheries, 1874, Pt. 1, p. 569 (275), pl. v, fig. 22.

Chiridotea cœca HARGER, Am. Jour. Sci., XV, 1878, p. 374; Proc. U. S. Nat. Mus., II, 1879, p. 159; Report U. S. Commissioner of Fish and Fisheries, 1880, Pt. 6, pp. 338–340, pl. IV, figs. 16–19.

Glyptonotus cœcus MIERS, Jour. Linn. Soc. Lond., XVI, 1883, pp. 17, 18.

Habitat.—Florida; New Haven, Connecticut; Long Island Sound; Vineyard Sound; Nantucket, Provincetown, Nahant, Massachusetts; Halifax, Nova Scotia.

Depth.—Found on surface.

100. CHIRIDOTEA TUFTSII (Stimpson).

Idotea tuftsii STIMPSON, Marine Inv. Grand Manan, 1853, p. 39.—VERRILL, Proc. Am. Assoc., 1873, p. 362, 1874; Report U. S. Commissioner of Fish and Fisheries, 1874, Pt. 1, p. 340 (46).—HARGER, Report U. S. Commissioner of Fish and Fisheries, 1874, Pt. 1, p. 569 (275).

Chiridotea tuftsii HARGER, Am. Jour. Sci., XV, 1878, p. 374; Proc. U. S. Nat. Mus., II, 1879, p. 159; Report U. S. Commissioner of Fish and Fisheries, 1880, Pt. 6, pp. 340, 341, pls. IV, figs. 20–23.

Glyptonotus tuftsii MIERS, Jour. Linn. Soc. Lond., 1883, XVI, pp. 18, 19.

Habitat.—Bay of Fundy; Long Island Sound; Massachusetts Bay; Casco Bay, Maine; Princes Cove, Eastport; Halifax, Nova Scotia.

Depth.—Surface to 25 fathoms.

42. IDOTEA Fabricius.

ANALYTICAL KEY TO THE SPECIES OF IDOTEA.

a. Terminal segment toothed or acute at its extremity.

  b. Body smooth, not tuberculate or rugose. Terminal segment with sides straight and slightly convergent to distal extremity, which is tridentate, with the postero-lateral teeth rounded and much less prominent than median tooth. Epimeral sutures of all the segments extend quite across the segments. Body striped, especially on males, with a median dorsal stripe of a lighter color than rest of body .... 101. *Idotea marina* (Linnæus).

  b′. Body rough and tuberculate. Terminal segment rounded off at posterior extremity to median terminal tooth, which is somewhat produced. Epimeral sutures of second and third thoracic segments do not entirely cross the segments, but allow the rounded postero-lateral lobes of these segments to form a part of the lateral margin. Body not striped longitudinally in median dorsal line with lighter color .... 102. *Idotea phosphorea* Harger.

a′. Terminal segment subtruncate at its extremity .... 103. *Idotea metallica* Bosc.

101. IDOTEA MARINA (Linnæus)

Oniscus marina Linnæus, Fauna Suecica, 1761, p. 500; Syst. Nat., 12th ed., 1766, p. 1060.—Fabricius, Mantissa Ins., I, 1787, p. 241.

Oniscus tridens Scopoli, Entom. Carniolica, 1763, p. 415.

Idotea entomon Pennant, Brit. Zool., IV, 1777, p. 38, pl. xviii, fig. 5.—Leach, Edinb. Encycl., VII, p. 404, pl. ccxxi, fig. 7; Trans. Linn. Soc., XI, 1815, p. 364.

Oniscus balthicus Pallas, Spic. Zool., (9) 1772, p. 67, pl. iv, fig. 6.

Asellus marinus Olivier, Encycl. Méth., IV, 1789, p. 254.

Cymothoa marina Fabricius, Ent. Syst., II, 1793, p. 506.

Cymothoa acuminata Fabricius, Ent. Syst., II, 1793, p. 508.

Idotea marina Fabricius, Ent. Syst. Suppl., 1798, p. 303.

Idotea acuminata Fabricius, Ent. Syst. Suppl., 1798, p. 303.—Latreille, Hist. Nat. Crust. & Ins., VI, 1803, p. 369.

Stenosoma irrorata Say, Jour. Acad. Nat. Sci. Phila., I, 1818, p. 423.—Gould, Rep. Invert. Mass., 1841, p. 338.

Idotea tricuspidata Desmarest, Dict. des Sci. Nat., XXVIII, 1823, p. 373, pl. xlvi, fig. 11; Consid. Crust., 1825, p. 289, pl. xlvi, fig. 11.—Roux, Cr. de la Méditerranée, 1830, pl. xxxix, figs. 11, 12.—Gould, Rep. Geol. Mass., 11th ed., 1835, p. 549.—Milne-Edwards, Hist. Nat. Crust., III, 1840, p. 129.—Lucas, Anim. artic. in Expl. Sci. Algér, Cr., I, 1849, p. 60.—Lilljeborg, Oefvers. Vet.-Ak. Förh., 1852, (9) p. 11.—M. Sars, Förh. Vidensk.-Selsk. Christ., 1859, p. 151.—Norman, Nat. Hist. Trans. Northumb., I, 1867, p. 25; Rep. Brit. Assoc., 1868, p. 197.—Bate and Westwood, Brit. Sessile-eyed Crust., II, 1868, p. 379, fig.—Stebbing, Jour. Linn. Soc., Zool., XII, 1874, p. 148.

Idotea basteri Audouin, Explic. Planches in Savigny's Égypte, pl. xii, fig. 6.—Roux, Cr. de la Méditerranée, 1830, pl. xxix, figs. 1–10.

Idotea variegata, Roux, Crust. de la Médit., 1830, pl. xxx, figs. 1–9.

Idotea (*Stenosoma*) *pusella* Eichwald, Reise auf dem caspisch. Meere, I, p. 138.

Idotea irrorata Milne-Edwards, Hist. Nat. Crust., III, 1840, p. 132.—Stimpson, Marine Inv. Grand Manan, 1853, p. 39.—Harger, Report U. S. Fish Com., Pt. 1, 1874, p. 569, pl. v, fig. 23; Proc. U. S. Nat. Mus., II, 1879, p. 160; Report U. S. Fish Com., 1880, Pt. 6, p. 343, pl. v, figs. 24–26.—Verrill, Am. Jour. Sci., VII, 1874, pp. 131, 135; Proc. Am. Assoc., 1874, pp. 369, 371, 373; Rep. U. S. Fish Com., 1874, Pt. 1, p. 316.

Idotea tricuspis DeKay, Zool. New York Fauna, Cr., 1844, p. 42, pl. ix, fig. 35.

Idotea brevicauda Dana, Am. Jour. Sci., VIII, 1849, p. 426; U. S. Expl. Exp., XIV, Cr. II, 1853, p. 702, pl. xlvi, fig. 4.

Idotea slabberii Bos, Bijd. Cr. Hedrioph Nederl., 1874, pp. 35, 69, pl. i, figs, 12, 13.

Idotea baltica Meinert, Nat. Tidsskr., XI, 1877, p. 81.

Idotea marina Miers, Jour. Linn. Soc. Lond., XVI, 1883, pp. 25–31 (see Miers for synonymy).

Habitat.—Nova Scotia and Gulf of St. Lawrence to North Carolina; Bermuda; also Mediterranean, Black, and Caspian seas; west coast of Europe to Great Britain; shores of the Netherlands; in German Ocean and Baltic; on Scandinavian and Finland coasts; South America, at Desterro and Rio Janeiro, Brazil; New Zealand; Red Sea; Java.

Depth.—Surface to 119 fathoms.

102. IDOTEA PHOSPHOREA Harger.

Idotea phosphorea HARGER, Report U. S. Commissioner of Fish and Fisheries, 1874, p. 569 (275), Pt. 1; Proc. U. S. Nat. Mus., 1879, II, p. 160.—VERRILL, Am. Jour. Sci., 1874, pp. 43, 45, 131; Proc. Amer. Assoc., 1873, pp. 362, 367, 369, 1874; Report U. S. Commissioner of Fish and Fisheries, 1874, Pt. 1, p. 316 (22).—WHITEAVES, Am. Jour. Sci., VII, 1874, p. 218.—HARGER, Report U. S. Commissioner of Fish and Fisheries, 1880, Pt. 6, pp. 347, 348, pl. v, figs. 27–29.

Habitat.—Entire coast of New England to Halifax, Nova Scotia, and Gulf of St. Lawrence.

Depth.—Surface to 18 fathoms.

103. IDOTEA METALLICA Bosc.

Idotea metallica BOSC, Hist. Nat. Crust., II, 1802, p. 179, pl. xv, fig, 6.—LATREILLE, Hist. Nat. Cr. et Ins., VI, 1803, p. 373.

Idotea atrata COSTA, Fauna del R. Napoli, Cr., 1838, pl. xi, fig. 3.

Idotea rugosa MILNE-EDWARDS, Hist. Nat. Crust., III, 1840, p. 131.

Idotea peloponesiaca ROUX, Cr. de la Méditerranée, 1830, pl. xxx, figs. 10, 12.

Idotea robusta KRØYER, Naturhistorisk. Tidsskrift, (2) II, 1846, p. 108; Voy. en Scand., Crust., pl. xxvi, fig. 3.—REINHARDT, Forteg. over Grönlands Krebsdyr, 1857, p. 35.—STIMPSON, Proc. Ac. Nat. Sci. Phila., 1863, p. 133.—VERRILL, Am. Jour. Sci., II, 1871, p. 360; Rep. U. S. Fish Com., 1874, Pt. 1, p. 439.—HARGER, Rep. U. S. Fish Com., 1874, p. 569, pl. v, fig. 24; Proc. U. S. Nat. Mus., II, 1879, p. 160; Rep. U. S. Fish Com., 1880, Pt. 6, p. 349, pl. vi, figs. 30–32.

Idotea compacta WHITE, List. Crust. Brit. Mus., 1847, p. 95.

Idotea algirica LUCAS, Anim. artic. in Expl. Sci. Algérie, I, Cr., 1849, p. 61, pl. vi, fig. 2.

Idotea metallica MIERS, Jour. Linn. Soc. Lond., XVI, 1883, p. 35–38 (see Miers for synonymy).

Habitat.—Off Maryland; Chesapeake Bay; North Carolina; Newport, Rhode Island; Long Island; Nantucket; Vineyard Sound; Woods Hole, Massachusetts; Georges Banks; Jeffries Bank; near Isles of Shoals; Halifax, Nova Scotia; La Have Bank; also Mediterranean Sea; between Greenland and Iceland; between Montevideo and Straits of Magellen; New South Wales; Borneo; off Cape Negro; Latitude Cove, Patagonia.

Depth.—Surface to 91 fathoms.

43. SYNIDOTEA Harger.

ANALYTICAL KEY TO THE SPECIES OF SYNIDOTEA.

a. Terminal abdominal segment pointed at its extremity. 104. *Synidotea nodulosa* (Krøyer).

a'. Terminal abdominal segment emarginate or notched at its extremity.
  b. Outlines of thorax subparallel............ 105. *Synidotea marmorata* (Packard).
  b'. Outlines of thorax strongly arcuate........ 106. *Synidotea bicuspida* (Owen).

104. SYNIDOTEA NODULOSA (Krøyer).

Idotea nodulosa KRØYER, Naturhist. Tidsskrift (2), II, 1846, p. 100; Voy. en Scand., Crust., 1849, pl. xxvi, fig. 2.—REINHARDT, Grönlands Krebsdyr, 1857, p. 34.—LÜTKEN, Crust. Greenland, 1875, p. 150.

Synidotea nodulosa Harger, Am. Jour. Sci., XV, 1878, p. 374; Proc. U. S. Nat. Mus., II, 1879, p. 160; Report U. S. Commissioner of Fish and Fisheries, 1880, Pt. 6, pp. 351, 352, pl. vi, figs. 33–35.

Habitat.—Southern Greenland; Halifax; Georges Banks; Arctic Seas and southward on Pacific coast as far as British Columbia.

Depth.—16 to 119 fathoms.

105. SYNIDOTEA MARMORATA (Packard).

Idotea marmorata Packard, Mem. Bos. Soc. Nat. Hist., I, 1867, p. 296, pl. viii, fig. 6.—Whiteaves, Canad. Nat., 1875, p. 262.

Idotea bicuspida Streets and Kingsley, Bull. Essex Inst., IX, 1877, p. 108.

(?) *Idotea rugulosa* Buchholz, Zweite Deutsche Nordpolarf., II, 1874, p. 285.

Synidotea bicuspida Harger, Proc. U. S. Nat. Mus., II, 1879, p. 160, Rep. U. S. Fish Com., 1880, p. 352, Pt. 6.

Edotea bicuspida Miers, Jour. Linn. Soc. London, XVI, 1883, p. 66.

Synidotea marmorata Benedict, Proc. Acad. Nat. Sci. Phila., 1897, p. 392.

Habitat.—Labrador; Grand Bank.

Depth.—36 to 129 fathoms.

106. SYNIDOTEA BICUSPIDA (Owen).

Idotea bicuspida Owen, Crustacea of the Blossom, 1839, p. 92, pl. xxvii, fig. 6.—Streets and Kingsley, Proc Essex Inst., IX, 1877, p. 108.

Idotea marmorata Packard, Mem. Bos. Soc. Nat. Hist., I, 1867, p. 296, pl. viii, fig. 6.

Idotea pulchra Lockington, Proc. Cal. Acad. Sci., VII, 1877, p. 45.

Synidotea bicuspida Harger, Proc. U. S. Nat. Mus., 1879, II, p. 160; Report U. S. Commissioner of Fish and Fisheries, 1880, Pt. 6, pp. 352–354.—Axel Ohlin, Bidrag till Kannedomen om Malakostrakfaunan i Baffin Bay och Smith Sound, 1895, p. 14.

Habitat.—Grand Bank; Sloop Harbor, Kynetarbuck Bay, Labrador; 66° 33′ N. lat., 61° 50′ W. long.; Arctic Seas; west coast of Alaska, north of Bering Straits; Kara Sea.

Depth.—5 to 13½ fathoms.

44. ERICHSONELLA[1] Benedict, new name.

ANALYTICAL KEY TO THE SPECIES OF ERICHSONELLA.

a. Surface of body smooth throughout. Outline of body regular. Antennulæ short. Caudal segment shows but slight traces of a lateral tooth near its base on either side .... 107. *Erichsonella attenuata* (Harger).

a′. Surface of body tuberculated. Outline of body serrate. Antennulæ long. Caudal segment with a prominent lateral tooth near its base on either side.

b. Large bifid tubercle on center of head. Median longitudinal row of tubercles on each thoracic segment................. 108. *Erichsonella filiformis* (Say).

b′. Large tridentate spine on center of head. Median longitudinal row of tubercles on each thoracic segment, and a longitudinal row of tubercles on either side of median row on first four thoracic segments.

109. *Erichsonella floridana* Benedict, new species.

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[1] Proposed by Dr. James E. Benedict for the preoccupied *Erichsonia.*

107. ERICHSONELLA ATTENUATA (Harger).

Erichsonia attenuata HARGER, Report U. S. Commissioner of Fish and Fisheries, 1874, Pt. 1, p. 570 (276), pl. VI, fig. 27; Proc. U. S. Nat. Mus., II, 1879, p. 160.—VERRILL, Report U. S. Commissioner of Fish and Fisheries, 1874, Pt. 1, p. 370 (76).—HARGER, Report U. S. Commissioner of Fish and Fisheries, 1880, Pt. 6, pp. 356, 357, pls. VI, VII, figs. 36–37.

Habitat.—Great Egg Harbor, New Jersey; Noank, Connecticut.

108. ERICHSONELLA FILIFORMIS (Say).

Stenosoma filiformis SAY, Jour. Acad. Nat. Sci., I, 1818, p. 424.—MILNE-EDWARDS, Hist. Nat. des Crust., III, 1840, p. 134.

Idotea filiformis WHITE, List Crust. Brit. Mus., 1847, p. 95.

Erichsonia filiformis HARGER, Report U. S. Commissioner of Fish and Fisheries, 1874, Pt. 1, p. 570 (276), pl. VI, fig. 26; Proc. U. S. Nat. Mus., 1879, II, p. 160.—VERRILL, Report U. S. Commissioner of Fish and Fisheries, 1874, Pt. 1, p. 316 (22).—HARGER, Report U. S. Commissioner of Fish and Fisheries, 1880, Pt. 6, pp. 355, 356, pl. VII, figs. 38–41.

Habitat.—Great Egg Harbor, New Jersey; Long Island Sound; Vineyard Sound, Massachusetts; Punta Rassa, Florida.

Depth.—4½ to 7 fathoms.

109. ERICHSONELLA FLORIDANA Benedict, new species.[1]

The body is long and narrow, broadest at the third and fourth segments. The head is wider than long. A rectangular projection extends forward in front of the eyes. The frontal margin between the projections is arcuate. The eyes are lateral, slightly projecting. The antennæ are geniculate. The three distal segments are approximately the same length. The terminal segment or flagellum is hairy.

A large tridentate spine occupies the center of the head. The main portion of the spine has a longitudinally compressed apex, the lateral portions arise at a distance from the base and point divergently forward, falling short of the elevation of the main portion.

The third and fourth segments of the thorax are the longest and widest; the posterior segments are successively shorter. The lateral margins of the segments are concave, making the segmental angles acute. The epimera are exposed in the concave margins. On the posterior margin of each segment at the median line is a single spine pointing backward. On the first four segments there are single lateral

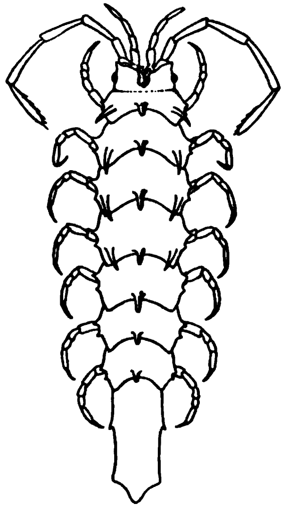

FIG. 21.—ERICHSONELLA FLORIDANA.

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[1] The description that follows is from Dr. Benedict's manuscript.

spines on the transverse median line similar in size, shape, and direction to those of the dorsal line.

The pleon consists of a single elongated segment with sub-parallel sides ending in a blunt apex. On each side of the pleon are two widely separated angular projections.

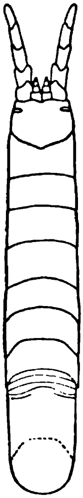

FIG. 22.—CLEANTIS PLANICAUDA.

Habitat.—Key West, Florida, among algæ below low tide.

Type.—Cat. No. 15786, U.S.N.M.

45. CLEANTIS Dana.

110. CLEANTIS PLANICAUDA Benedict.

Cleantis planicauda BENEDICT, in Richardson, Proc. U. S. Nat. Mus., XXI, 1899, p. 851, footnote.

Habitat.—Pensacola, Florida.

46. EDOTEA Guérin-Ménéville.

ANALYTICAL KEY TO THE SPECIES OF EDOTEA.

a. Anterior angles of head produced into knob-like projections. Lateral angles of thoracic segments produced into knob-like projections. Four tubercles situated on the dorsal surface of the head.......................... 111. *Edotea acuta* Richardson.

a'. Anterior angles of head not produced into knob-like projections. Lateral angles of thoracic segments not produced into knob-like projections. Two tubercles situated on dorsal surface of head.

b. Lateral margins of thorax nearly even. Anterior angles of head not salient. Lateral margins of terminal segment scarcely indented. 112. *Edotea triloba* (Say).

b'. Lateral margins of thorax angulated and salient. Anterior angles of head salient. Lateral margins of terminal segment indented, abdomen more elongated.... 113. *Edotea montosa* (Stimpson).

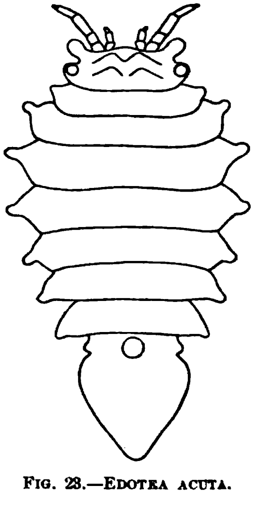

FIG. 23.—EDOTEA ACUTA.

111. EDOTEA ACUTA Richardson.

Edotea acuta RICHARDSON, Am. Nat., XXXIV, 1900, p. 228.

Head with its antero-lateral angles produced in knob-like projections. Four tubercles situated on surface of head, two on the anterior part, and two on the posterior part. First pair of antennæ not reaching beyond the lateral projections. Second pair twice as long as lateral projections, and carrying a rudimentary flagellum.

Thoracic segments subequal. Sides of all the segments produced into knob-like projections.

Terminal abdominal segment with a transverse depression or groove on either side of which the lateral margin is indented. Apex of segment produced as in *Edotea montosa*.

Color white.

Three specimens were found in the stomach of a cod, taken by the U. S. Fish Commission steamer *Albatross*,

Depth.—105 fathoms.

Type.—Cat. No. 23909, U.S.N.M.

112. EDOTEA TRILOBA (Say).

Idotea triloba SAY, Jour. Acad. Nat. Sci. Phila., I, 1818, p. 425.—MILNE-EDWARDS, Hist. Nat. des Crust., III, 1840, p. 134.

Jæra triloba WHITE, List Crust. Brit. Mus., 1847, p. 97.

Epelys trilobus SMITH, Report U. S. Commissioner of Fish and Fisheries, 1874, Pt. 1, p. 571 (277), pl. VI, fig. 28.—VERRILL, Am. Jour. Sci., VII, 1874, p. 135; Proc. Amer. Assoc., 1873, p. 372, 1874; Report U. S. Commissioner of Fish and Fisheries, 1874, Pt. 1, p. 370 (76).—HARGER, Proc. U. S. Nat. Mus., II, 1879, p. 160; Report U. S. Commissioner of Fish and Fisheries, 1880, Pt. 6, pp. 358–359, pl. VII, figs. 42 and 43.

Edotea triloba MIERS, Jour. Linn. Soc. Lond., XVI, 1883, p. 70–71.

Habitat.—Egg Harbor, New Jersey; Savin Rock, near New Haven, Connecticut; Noank Harbor, Connecticut; Vineyard Sound, Provincetown, Massachusetts; near Cape Cod; Gloucester; 30 miles northeast of Portland, Casco Bay, Maine.

Depth.—Surface to one-half fathom.

113. EDOTEA MONTOSA (Stimpson).

Idotea montosa STIMPSON, Mar. Inv. Grand Manan, 1853, p. 40.

Epelys montosus HARGER, Report U. S. Commissioner of Fish and Fisheries, Pt. 1, 1874, p. 571 (277); Proc. U. S. Nat. Mus., II, 1879, p. 161.—VERRILL, Am. Jour. Sci., VII, 1874, p. 45; Proc. Amer. Assoc., p. 367, 1874; Report U. S. Commissioner of Fish and Fisheries, Pt. 1, 1874, p. 370 (76).—SMITH and HARGER, Trans. Conn. Acad., III, 1874, p. 3.—HARGER, Report U. S. Commissioner of Fish and Fisheries, 1880, Pt. 6, p. 359–360, pl. VIII, figs. 44–47.

Edotea montosa MIERS, Jour. Linn. Soc. Lond., XVI, 1883, p. 72.

Habitat.—Block Island Sound; Long Island Sound; Vineyard Sound; Eastport, Maine; Georges Bank; Stellwagens Bank; Casco Bay; Bay of Fundy; Halifax, Nova Scotia; Grand Manan.

Depth.—2 to 40 fathoms.

Family XIII. ARCTURIDÆ.

ANALYTICAL KEY TO THE GENERA OF ARCTURIDÆ.

a. Fourth segment of thorax not greatly longer than others. Marsupium of female composed of four pairs of plates .... 47. *Arcturus.*

a'. Fourth segment of thorax much longer than any of the others. Marsupium of female consisting of two plates affixed to this segment .... 48. *Astacilla.*

47. ARCTURUS Latreille.

ANALYTICAL KEY TO THE SPECIES OF ARCTURUS.

a. Terminal segment of abdomen armed with a long median terminal spine, projecting beyond the end of the segment.

b. Head with two spines. Second joint of second pair of antennæ armed with one spine at upper end. Thorax with few spines. Surface of terminal abdominal segment smooth.

c. Second joint of peduncle of second pair of antennæ without spine at base on outer margin. First pair of antennæ extending one-third the length of the third joint of second pair of antennæ. Dorsal spines wanting on second abdominal segment. Spines wanting on opercular valves. Anterior thoracic appendages furnished with a number of spines on the proximal joints. 114. *Arcturus purpureus* Beddard.

c′. Second joint of peduncle of second pair of antennæ with spine at base on outer margin. First pair of antennæ extending two-thirds the length of the third joint of second pair of antennæ. Dorsal spines present on second abdominal segment. Spines present on opercular valves. Anterior thoracic appendages without spines except on penultimate joint. 115. *Arcturus caribbæus*, new species.

b′. Head with eight spines. Second joint of second pair of antennæ armed with three spines at the upper end. Thorax with many spines. Surface of terminal abdominal segment with three rows of spines on dorsal surface. Row of spines on each opercular valve...... 116. *Arcturus floridanus* Richardson.

a′. Terminal segment of abdomen not armed with a long median terminal spine.

b. Four anterior segments of thorax with spines or tubercles. Middle surface of abdomen with prominent spiny projections. With conical lateral projections. Epimera pointed.................... 117. *Arcturus baffini* (Sabine).

b′. Four anterior segments of thorax without spines or tubercles. Middle surface of abdomen without any indication of prominent spiny projections. Without conical lateral projections. Epimera less pointed. 118. *Arcturus feildeni* Miers.

114. ARCTURUS PURPUREUS Beddard.

Arcturus purpureus BEDDARD, Proc. Zool. Soc. Lond., 1886, Pt. 1, p. 109; Report on the Scientific Results of the Exploring Voyage of H. M. S. *Challenger*, Zool. XVII, pp. 112, 113.

Habitat.—Off Sombrero Island.
Depth.—450 fathoms.

115. ARCTURUS CARIBBÆUS, new species.

Head with a deep excavation on the anterior margin, on either side of which the antero-lateral margins are produced, each bearing a short spine at the outer angle. Two long spines are situated on the anterior portion of the head, between the eyes. The first pair of antennæ, consisting of four joints, reach two-thirds of the length of the third joint of the second pair of antennæ. The first joint of the second pair of antennæ is short and unarmed; the second joint is armed with a small spine at the base on the outer margin, and a large spine on the upper lateral margin; the third joint is about three times as long as the second joint, and is armed with two long spines at the upper end; the fourth joint is about twice as long as the third joint, and is armed with a single spine at the upper end; the fifth joint is somewhat longer than the fourth and is unarmed; the flagellum is long and consists of ten joints.

The first, second, third, and fifth thoracic segments have each two long projecting spines on either side of the median dorsal line. The fourth, sixth, and seventh segments are without these spines. The first segment has three spines, one large central spine and two small spines on each antero-lateral margin. All the other thoracic segments have one long spine on each lateral margin.

The first abdominal segment has one lateral spine on each side; the second segment has two dorsal spines, one on either side of the median line. The third segment has one lateral spine on each side. The terminal segment is rounded in outline posteriorly, with two lateral spines on either side, one a little below the middle and one near the posterior margin of the segment. There is also a large terminal spine on the dorsal surface.

The opercular valves are armed each with a single spine about the center of the valve. The penultimate joint of the second, third, and fourth anterior pairs of legs is armed with a single spine.

One specimen of this species was taken by the U. S. Fish Commission steamer *Albatross* near Aves Island, Caribbean Sea.

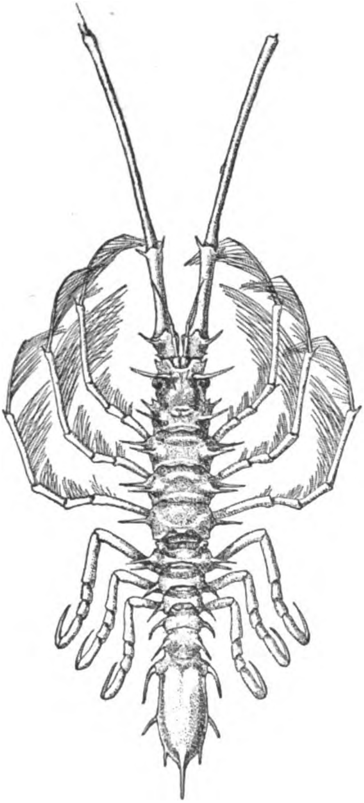

FIG 24.—ARCTURUS CARIBBÆUS.

Type.—Cat. No. 9113, U.S.N.M.

This species closely resembles *Arcturus purpureus* Beddard, differing from that species in having two dorsal spines on the second abdominal segment, spines on the opercular valves, and at the base on the outer margin of the second joint of the peduncle of the second pair of antennæ, in wanting spines on the proximal joints of the anterior thoracic appendages, with the exception of the penultimate joint, and in the greater length of the first pair of antennæ.

116. ARCTURUS FLORIDANUS Richardson.

Arcturus floridanus RICHARDSON, Am. Nat., XXXIV, 1900, p. 230.

Head with deep anterior excavation, on each side of which the lateral margins are produced, bearing each a single spine at the outer angle. On the anterior portion of the head are two long spines situated between the eyes. Two long spines are placed on the posterior portion of the head, between the line of the eyes, on either side of which are two small spines, one near each eye and one on the lateral margin. The first pair of antennæ are short, reaching only half the length of the third joint of the second pair of antennæ. The first joint of the second pair of antennæ is short and unarmed; the second joint has one short spine at the base and three long ones at the upper end; the third joint is nearly three times as long as the second joint and has two long spines at the upper end; the fourth joint is armed with a single spine; the fifth joint is unarmed; the flagellum is nine-jointed.

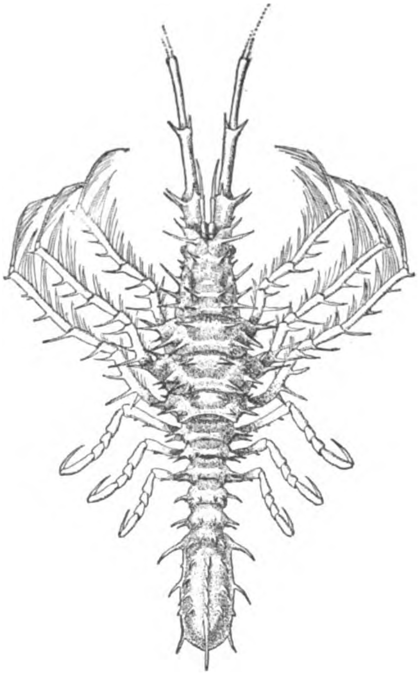
FIG. 25.—ARCTURUS FLORIDANUS.

The first thoracic segment has two dorsal spines on the anterior part, one on either side of the median line, six spines on the posterior part, three on either side of the median line, and two lateral spines; the second thoracic segment has three spines on the anterior portion, one on the median line and one on either side of it, four spines on the posterior portion, two on either side of the median line, and three lateral spines; the third thoracic segment has two spines on the anterior portion, one on either side of the median line, four spines on the posterior portion, two on either side of the median line, and four lateral spines; the fourth segment has two spines on the anterior part, one on either side of the median line, four spines on the posterior part, two on either side of the median line, and four lateral spines; the fifth segment has two spines widely separated, one on either side of the median line, and one lateral spine; the sixth and seventh segments have six spines, three on either side of the median line, and one lateral spine.

The first three abdominal segments have each eight small spines, four on either side of the median line. The terminal segment has one median row of spines and a row on either side of this and a lateral row. The median row consists of five small spines and one large terminal spine. The dorsal row on either side of the median row each consists of four spines. The outer marginal lateral rows each consists of three spines. The opercular valves bear each a longitudinal row of eight spines.

Both the anterior and the posterior pairs of legs are covered with spines, the anterior ones more densely.

Two specimens, one imperfect, were obtained by the U. S. Fish Commission steamer *Albatross*, at Fernandina, Florida.

Type.—Cat. No. 11522, U.S.N.M.

117. ARCTURUS BAFFINI (Sabine).

Idotea baffini SABINE, Suppl. to App. to Capt. Parry's Voyage, 1824, p. 228, pl. I, figs. 4–6.

Arcturus baffini MILNE-EDWARDS, Hist. Nat. Crust., III, p. 123, pl. XXXI, fig. 1.—G. O. SARS, Den Norske Nordhavs-Exped., Zool., Crust., I, p. 97, pl. IX, figs. 1–21.—HANSEN, Vid. Medd. naturh. Foren. i Kjoebh., 1887, p. 188.—AXEL OHLIN, Bidrag till Kannedomen om Malakostrakfaunan i Baffin Bay och Smith Sound, 1895, pp. 15–18.

Habitat.—65° 35′ N. lat., 54° 50′ W. long.; 66° 32′ N. lat., 55° 34′ W. long.; 67° 59′ N. lat., 56° 33′ W. long.; 68° 9′ N. lat., 56° 32′ W. long.; 70° 21′ N. lat., 55° 40′ W. long.; 71° 10′ N. lat., 58° 56′ W. long.; 78° 24′ N. lat., 74° W. long.; Inglefield Gulf; Murchison Sound; Cape Faraday; 72° 38′ N. lat., 77° 10′ W. long.; 72° 8′ N. lat., 74° 20′ W. long.

Depth.—5 to 150 fathoms.

118. ARCTURUS FEILDENI Miers.

Arcturus baffini var. *feildeni* MIERS, Ann. Mag. Nat. Hist. (4), XX, 1877, p. 64.

Arcturus feildeni BENEDICT, Proc. Biol. Soc. Wash., XII, 1898, p. 44.

Habitat.—Camp Clay, Cape Sabine; Davis Straits; off Churchill, Hudson Bay.

Depth.—30 fathoms.

48. ASTACILLA Fleming.

ANALYTICAL KEY TO THE SPECIES OF ASTACILLA.

a. With eyes. Head excavate in front without rostriform point. Fourth thoracic segment subcylindrical. Terminal abdominal segment with a prominent, subacute tooth on each side, above the middle, directed outward and backward; extremity obtuse........................ 119. *Astacilla granulata* (G. O. Sars).

a′. Without eyes. Head with a rostriform point in front, between the antennulæ. Fourth thoracic segment wider at the anterior end, and tapering to the posterior end. Terminal abdominal segment with a pair of teeth on each side; extremity acute........................ 120. *Astacilla cæca* Benedict.

119. ASTACILLA GRANULATA (G. O. Sars).

Leachia granulata G. O. SARS, Arch. Math. Nat., II, 1877, p. 351 (251).
Astacilla americana HARGER, Am. Jour. Sci., XV, 1878, p. 374.
Astacilla granulata HARGER, Proc. U. S. Nat. Mus., II, 1879, p. 161; Report U. S. Commissioner of Fish and Fisheries, 1880, Pt. 6, pp. 364–367, pls. VIII–IX, figs. 48–52.

Habitat.—Georges Bank; Banquereau; Miquelon Island, south of Newfoundland; also between Norway and Iceland.

Depth.—7 to 250 fathoms.

120. ASTACILLA CÆCA Benedict.

Astacilla cæca BENEDICT, Proc. Biol. Soc. Washington, XII, 1898, p. 51.

Habitat.—Lat. 38° 22′ N., Long. 70° 17′ 30″ W. (South of Marthas Vineyard.)

Depth.—1,825 fathoms.

IV. ASELLOTA or ASELLOIDEA.

ANALYTICAL KEY TO THE FAMILIES OF ASELLOTA.

- *a.* Eyes generally present. First pair of legs prehensile or subcheliform. Last three pairs of legs ambulatory, not natatory.
  - *b.* Three posterior segments of thorax not sharply marked off from the four anterior ones, and not smaller. Caudal segment large, shieldlike. Eyes, when present, lateral or subdorsal, not placed on peduncle-like projections of the head. Superior antennæ issuing close together. Legs subequal in length.
    - *c.* Lateral parts of head scarcely expanded. Eyes, when present, small, lateral. Peduncle of inferior antennæ without small accessory appendage outside of third joint. Legs ambulatory, except first pair, which are distinctly subcheliform; legs with dactylus generally uni-unguiculate. First pair of pleopoda in female very small, not operculiform. Outer lamella of second pair very large and incrusted, so as to form, together with corresponding lamellæ of the other side, a sort of operculum, covering the two succeeding pairs.................................. Family XIV. ASELLIDÆ (p. 551).
    - *c′.* Lateral parts of head lamellarly expanded. Eyes, when present, usually subdorsal. Peduncle of inferior antennæ generally with small accessory appendage outside of third joint. Legs ambulatory, except first pair, which are sometimes prehensile; legs with dactylus generally bi- or tri-unguiculate. First pair of pleopoda in female transformed into a single, large opercular plate. Outer lamellæ of two succeeding pairs narrow and confluent with basal part.............................. Family XV. JANIRIDÆ (p. 553).
  - *b′.* Three posterior segments of thorax, as a rule, sharply marked off from four anterior ones, and much smaller. Caudal segment more or less vaulted above, subpyriform. Eyes, when present, placed on the tips of lateral peduncle-like projections of the head. Superior antennæ placed widely apart. First pair of legs much shorter than others. Succeeding pairs more or less rapidly increasing in length.......Family XVI. MUNNIDÆ (p. 556).
- *a′.* Eyes wanting. First pair of legs subprehensile. Last three pairs of legs natatory, with some of joints flattened and ciliated. First pair of legs shorter than three following pairs. Second, third, and fourth pairs very elongate. Family XVII. MUNNOPSIDÆ (p. 557).

Family XIV. ASELLIDÆ.

ANALYTICAL KEY TO THE GENERA OF ASELLIDÆ.

a. Mandibles without a palp. Last six pairs of legs with dactylus biunguiculate.
49. *Mancasellus.*

a'. Mandible with a three-jointed palp. Last six pairs of legs uniunguiculate.

b. Eyes present. Body oblong, depressed. Head small, narrower and shorter than first thoracic segment. Caudal segment not longer than broad.
50. *Asellus.*

b'. Eyes wanting. Body elongate, narrow. Head large, not narrower than first thoracic segment, and longer. Caudal segment much longer than broad.
51. *Cæcidotea.*

49. MANCASELLUS Harger.

ANALYTICAL KEY TO THE SPECIES OF MANCASELLUS.

a. Lateral margins of head entire .... 121. *Mancasellus brachyurus* Harger.

a'. Lateral margins of the head not entire. External antennæ as long or longer than the body .... 122. *Mancasellus lineatus* (Say).

121. MANCASELLUS BRACHYURUS Harger.

Mancasellus brachyurus Harger, Am. Jour. Sci., XI (1876), pp. 304, 305.—Bovallius, Bihang till K. Sv. Vet.-Akad. Handl., II, No. 15, 1886, p. 39.

Habitat.—McKee's Spring, Lexington, Virginia.

122. MANCASELLUS LINEATUS (Say).

Asellus lineatus Say, Jour. Ac. Nat. Sci. Phila., I, 1818, p. 428.

Habitat.—South Carolina.

50. ASELLUS Geoffroy.

ANALYTICAL KEY TO THE SPECIES OF ASELLUS.

a. Caudal stylets broad and flattened. Propodus of first pair of legs much enlarged and subglobular, with a prominent acute tooth about or a little above the middle and a lobe bearing one or two acute teeth near the base on its palmar margin .... 123. *Asellus communis* Say.

a'. Caudal stylets extremely narrow and cylindrical. Propodus of first pair of legs narrow, elongate, without prominent acute tooth on its palmar margin.
124. *Asellus attenuatus* Richardson.

123. ASELLUS COMMUNIS Say.

Asellus communis Say, Jour. Ac. Nat. Sci., Phila., I, 1818, pp. 427, 428.—Smith, Rep. U. S. Fish Com., 1874, p. 657.

Habitat.—Schuylkill River, Pennsylvania; Connecticut; Massachusetts; New York; Indiana; Illinois; Michigan; Mississippi.

124. ASELLUS ATTENUATUS Richardson.

Asellus attenuatus RICHARDSON, Am. Nat., XXXIV, 1900, p. 297.

Body narrowed anteriorly, gradually increasing in width backward. Head narrower than the first thoracic segment, rounded at the sides with margins entire and a small lobe near the base on either side; front somewhat excavate for the reception of the antennæ. Eyes distinct, lateral. First pair of antennæ as long as the peduncle of the second pair; first joint short and broad; second joint more slender; third joint not quite as long as second joint; flagellum composed of thirteen joints. Second pair of antennæ as long as the body; first, second, and third joints short, about equal in length; fourth and fifth joints long; flagellum multiarticulate.

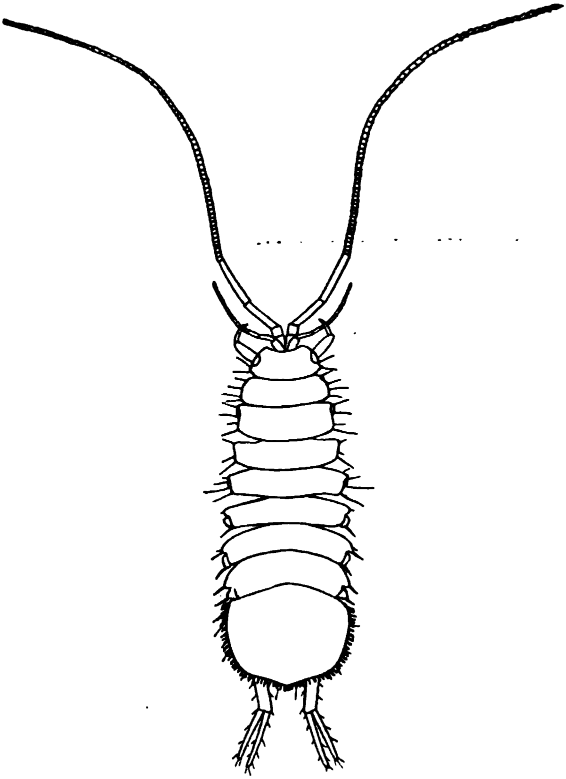

FIG. 26.—ASELLUS ATTENUATUS.

Segments of thorax with the lateral margins of the first segment slightly emarginate anteriorly, the emargination being filled by the epimeron; second, third, and fourth segments with the margins entire, the epimera evident at the extreme anterior angles; the fifth segment with the posterior two-thirds emarginate, the epimeron conspicuous in the emargination; the sixth and seventh segments posteriorly emarginate, with prominent epimera.

Terminal segment of the body about as broad as long, with a small rounded lobe in the middle of the posterior margin. The uropoda are somewhat longer than the terminal segment, extremely slender and cylindrical in shape, with both branches nearly equal in length, and longer than the peduncle.

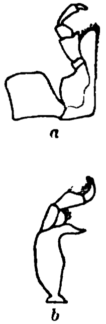

Fig. 27.—a. Maxilliped; b. Mandible.

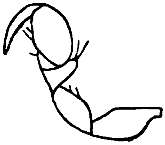

Fig. 28.—Leg of the first pair.

The legs of the first pair are slender; the dactylus is serrate along the inner margin, the propodus is narrow, oval in shape, and unarmed.

The color is reddish-brown mottled with white. All the free margins of the body are fringed with hairs. The lateral margins of the segments and the caudal segment are armed with spines. The uropoda and the legs are spinulose.

A large number of specimens were collected by Mr. William Palmer and Mr. Paul Bartsch, at Washington Ditch, Dismal Swamp, Virginia.

Type.—Cat. No. 23910, U.S.N.M.

51. CÆCIDOTEA Packard.

125. CÆCIDOTEA STYGIA Packard.

Cæcidotea stygia Packard, Am. Naturalist, V, 1871, p. 752, figs. 132, 133.
Cæcidotea microcephala Cope, Am. Naturalist, V, 1872 p. 411, fig. 109.

Habitat.—Graham's Spring, Lexington, Virginia; also Mammoth Cave, Kentucky, and wells in Indiana.

Family XV. JANIRIDÆ.

ANALYTICAL KEY TO THE GENERA OF JANIRIDÆ.

a. Head without any true rostrum. First pair of antennæ extremely small with flagellum rudimentary. Second pair of antennæ of moderate length, without any distinctly squamiform appendage. First pair of legs not prehensile. Uropoda extremely small, branches very short, nodiform .... 52. *Jæra.*

a′. Head with prominent rostral projection, obtuse in front or with a comparatively short rostral projection. First pair of antennæ well developed, flagellum multiarticulate. Second pair of antennæ very much elongated with a well-marked scale-like appendage outside of third joint. First pair of legs prehensile, carpus large, subfusiform and edged inside with spines; propodus narrow, linear, and very movably articulated to carpus, so as to admit of being bent against it. Uropoda largely developed, with branches slightly unequal.

- b. Head with lateral parts produced to very prominent acute lappets. Segments of thorax with lateral parts laciniate and produced. Caudal segment forming on each side, at the end, a triangular expansion .... 53. *Ianthe.*
- b′. Head with lateral parts not produced into lappets. Segments of thorax with lateral parts not produced, not laciniate. Caudal segment rounded, not expanded laterally .... 54. *Ja*

52. JÆRA Leach.

126. JÆRA MARINA (Fabricius).

Oniscus marinus Fabricius, Fauna Grönlandica, p. 252.

Oniscus albifrons Montagu, manuscript (Leach).

Jæra albifrons Leach, Ed. Encyc., VII, 1813–14, p. 434 (Am. ed., p. 273); Trans. Linn. Soc., XI, 1815, p. 373.—Desmarest, Dict. Sci. Nat., XXVIII, 1823, p. 381; Consid. Crust., 1825, p. 316.—Latreille, Règne Anim., IV, 1829, p. 141.—Edwards, Annot. de Lamarck, V, 1838, p. 267; Hist. Nat. des Crust., III, 1840, p. 150; Règne Anim., Crust., 1849, p. 204.—Lilljeborg, Öfvers. vet. Akad. Forh., VIII, 1851, p. 23; IX, 1852, p. 11.—M. Sars, Christ. Vid. Selsk. Forh., p. 153, 1859.—Bate, Rep. Brit. Assoc., 1860, p. 225, 1861.—G. O. Sars, Reise ved Kyst. of Christ., 1866, p. 29; Christ. Vid. Selsk. Forh., 1871, p. 272, 1872.—Norman, Rep. Brit. Assoc., 1866, p. 197, 1867; 1868, p. 288, 1869.—Bate and Westwood, Brit. Sess. Crust., II, 1868, p. 317, fig.—Stebbing, Jour. Linn. Soc. Lond., Zool., XII, 1874, p. 149; Ann. Mag. Nat. Hist. (4), XVII, 1876, p. 79, pl. v, figs. 5, 6; Trans. Devon. Assoc., 1879, p. 7.—Meinert, Crust. Isop. Amph. Dec. Dan., 1877, p. 80.—Harger, Proc. U. S. Nat. Mus., 1879, II, p. 158; Report U. S. Commissioner of Fish and Fisheries, 1880, Pt. 6, pp. 315–318, pl. i, figs. 4–8. (See Harger for synonymy.)

Jæra kroyeri Zaddach, Syn. Crust. Pruss. Prod., 1844, p. 11.

Jæra baltica Fried. Müller, Arch. Naturg., XIV, 1848, p. 63, pl. iv, fig. 29.

Jæra copiosa Stimpson, Mar. Inv. Grand Manan, 1853, p. 40, pl. iii, fig. 29.—Verrill, Am. Jour. Sci. (3), VII, 1874, p. 131; Proc. Amer. Assoc., 1873, p. 369, 1874; Report U. S. Commissioner of Fish and Fisheries, 1874, Pt. 1, p. 315 (21).—Harger, Report U. S. Commissioner of Fish and Fisheries, 1874, Pt. 1, p. 571 (277).

Jæra nivalis Packard, Mem. Bost. Soc. Nat. Hist., I, 1867, p. 296.

Asellus grönlandicus Packard, Mem. Bost. Soc. Nat. Hist., I, 1867, p. 296.

Jæra marina Möbius, Wirbellos. Thiere der Ostsee, 1873, p. 122; Am. Mag. Nat. Hist. (4), XII, 1873, p. 85.

Jæra maculata Parfitt, Trans. Devon. Assoc., 1873, p. 253 (18).—Stebbing, Trans. Devon. Assoc., 1879, p. (7).

Jæra marina Sars, Crust. of Norway, II, Pt. 1, 1897, p. 104.

Habitat.—Whole coast of New England; Labrador; Bay of Fundy; also coasts of England, Scotland, Finmark, and all the coasts of the North Sea; Germany.

Depth.—Found on surface.

53. IANTHE Bovallius.

ANALYTICAL KEY TO THE SPECIES OF IANTHE.

a. Rostrum as long as head. Flagellum of first pair of antennæ 12-articulated, shorter than breadth of head. Flagellum of second pair of antennæ 50-articulated. First thoracic segment shorter than second. Second and third segments equal, longest, much longer than seventh. Terminal segment smooth on dorsal side, without spine-like tubercle. Peduncles of uropoda longer than postero-lateral angulations of terminal segment................ 127. *Ianthe spinosa* (Harger).

a′. Rostrum much longer than head. Flagellum of first pair of antennæ 60 to 70 articulated, nearly as long as breadth of head. Flagellum of second pair of antennæ 280-articulated. First thoracic segment as long as second. Seventh segment is longest. Terminal segment with a single spine-like tubercle on its dorsal side. Peduncles of uropoda shorter than postero-lateral angulations of terminal segment of body.................... 128. *Ianthe speciosa* Bovallius.

127. IANTHE SPINOSA (Harger).

Janira spinosa HARGER, Proc. U. S. Nat. Mus., II, 1879, p. 158; Report U. S. Fish Commissioner, 1880, Pt. 6, pp. 323, 324.
Ianthe spinosa BOVALLIUS, Bihang t. Kgl. Sv. Vet. Akad. Handl., XI, No. 15, 1886, p. 35.
Janira spinosa HANSEN, Vid. Medd. naturh. Foren. i. Kjoebh., 1887, p. 191.

Habitat.—Banquereau; 65° 35′ N. lat., 54° 50′ W. long.; 66° 32′ N. lat., 55° 34′ W. long.; 67° 59′ N. lat., 56° 33′ W. long.

Depth.—80 to 100 fathoms.

128. IANTHE SPECIOSA Bovallius.

Ianthe speciosa BOVALLIUS, Bihang till K. Sv. Vet. Akad. Handl., VI No. 4, p. 5; XI, No. 15, 1886, p. 35.

Habitat.—Baffins Bay.

54. JANIRA Leach.

ANALYTICAL KEY TO THE SPECIES OF JANIRA.

a. Anterior margin of head straight .... 129. *Janira maculosa* Leach.
a′. Anterior margin of head produced in the middle in a short sharp rostrum, and the antero-lateral angles of head also produced.
  b. Antero-lateral angles of head sharp. Lateral margins of first four thoracic segments obtusely incised, each showing two broad angulations. Uropoda of female shorter than half the terminal segment. Those of male as long as terminal segment of body .... 130. *Janira tricornis* (Krøyer).
  b′. Antero-lateral angles of head shorter and less sharp. Margins of first thoracic segment rounded, not emarginate. Uropoda alike in the two sexes, and as long as terminal segment of body .... 131. *Janira alta* (Stimpson).

129. JANIRA MACULOSA Leach.

Janira maculosa LEACH, Edinburgh Encyclop., VII, 1813–14, p. 434.
Henopomus muticus KRØYER, Voy. en Scand., Crust., pl. XXX, figs. 1a–n; Nat. Tidsskr., Ny R., II, p. 366.—HANSEN, Vid. Medd. naturh. Foren. i Kjoebh., 1887, p. 190.

Habitat.—66° 32′ N. lat., 55° 34′ W. long.; 72° 32′ N. lat., 58° 51′ W. long.; also British Isles; Kattegat; Dutch Coast; coast of France; coast of Norway.

Depth.—100 to 116 fathoms.

130. JANIRA TRICORNIS (Krøyer).

Henopomus tricornis KRØYER, Voy. en. Scand., Crust., pl. XXX, figs. 2 a–q; Nat. Tidsskr. Ny R., II, 1847, p. 372.—HANSEN, Vid. Medd. naturh. Foren. i Kjoebh., 1887, pp. 190–191.

Habitat.—Kangerdluassuk; Sukkertoppen; Egesminde; 65° 11′ N. lat., 53° 33′ W. long.

Depth.—5 to 50 fathoms.

131. JANIRA ALTA (Stimpson).

Asellodes alta STIMPSON, Mar. Inv. Grand Manan, 1853, p. 41, pl. III, fig. 30.—VERRILL, Am. Jour. Sci., VI, 1873, p. 439; VII, 1874, pp. 411–502; Proc. Amer. Assoc., 1873, p. 350, 1874.

Janira alta HARGER, Proc. U. S. Nat. Mus., 1879, II, p. 158; Report U. S. Commissioner of Fish and Fisheries, 1880, Pt. 6, pp. 321, 322, pls. II–III, figs. 9, 12, 13.

Habitat.—Long Island; Massachusetts Bay; near Eastport, Maine; Gulf of Maine; Grand Manan; Bay of Fundy; 120 miles south of Halifax; Clarkes Ledge; 30 miles east of Sable Island.

Depth.—35 to 300 fathoms.

Family XVI. MUNNIDÆ.

55. MUNNA Krøyer.

ANALYTICAL KEY TO THE SPECIES OF MUNNA.

a. Caudal segment with lateral edges evenly convex, and each armed with a single slender denticle; apical lamellæ distinctly serrated. Eyes large. Superior antennæ with flagellum composed of four joints, including very small apical joint. Flagellum of inferior antennæ longer than peduncle. Last pair of legs scarcely longer than body. Legs slender. Uropoda obliquely truncate at tip .... 132. *Munna fabricii* Krøyer.

a′. Caudal segment with lateral edges rather bulging in front, and each armed with four strong denticles; without any serrulated lamellæ. Eyes small. Superior antennæ with flagellum composed of three joints, including very small apical joint. Flagellum of inferior antennæ not attaining length of peduncle. Last pair of legs scarcely longer than anterior division of body. Legs shorter and stouter than usual. Uropoda produced at tip into several dentiform projections, one of which is hook-like................ 133. *Munna krøyeri* Goodsir.

132. MUNNA FABRICII Krøyer.

Munna fabricii KRØYER, Nat. Hist. Tidssk. (2), II, p. 380; Voy. en Scand., Crust., pl. XXXI, figs. 1a–q.—REINHARDT, Grönland's Krebsdyr., 1857, p. 35.—M. SARS, Christ. Vid. Selsk. Forh., 1858, pp. 154, 1859.—LÜTKEN, Greenland Crust., 1875, p. 150.—HARGER, Proc. U. S. Nat. Mus., 1879, II, p. 159; Report U. S. Commissioner of Fish and Fisheries, 1880, Pt. 6, pp. 325–328, pl. III, fig. 14.—G. O. SARS, Crust. of Norway, II, Pts. 5, 6, pp. 108, 109, 1896.

Habitat.—South Bay, Eastport; Casco Bay; Western Bank; Browns Bank; southern Greenland; also coast of Finmark; coast of Norway.

Depth.—12 to 200 fathoms.

133. MUNNA KRØYERI Goodsir.

Munna krøyeri GOODSIR, Edinb. New Phil. Journ., XXXIII, p. 365, pl. VI, fig. 2.—BATE and WESTWOOD, Brit. Sessile-eyed Crust., II, p. 326.

Munna whiteana BATE and WESTWOOD, Brit. Sessile-eyed Crust., II, p. 329.

Munna krøyeri HANSEN, Vid. Medd. naturh. Foren. i Kjoebh., 1887, pp. 194, 195.—G. O. SARS, Crust. of Norway, II, Pts. 5, 6, pp. 109, 110, 1896.

Habitat.—Godthaab and Upernivik, Greenland; coast of Norway.

Depth.—10 to 60 fathoms.

Family XVII. MUNNOPSIDÆ.

ANALYTICAL KEY TO THE GENERA OF MUNNOPSIDÆ.

a. Head of moderate size, deeply emarginate on each side for the insertion of the antennæ, frontal part produced. First four thoracic segments transversely excavated dorsally. Superior antennæ with flagellum multiarticulate. Natatory legs of the same structure, carpal joint foliaceous.

b. Body with anterior division much broader than posterior; three posterior segments densely crowded together. Caudal segment oblong-oval. Mandibles without any molar expansion; cutting edge but slightly dentated. First two pairs of legs of same structure, though somewhat different in size; two succeeding pairs elongated. Dactylus wanting on natatory legs. Uropoda simple, biarticulate.. 56. *Munnopsis.*

b.′ Body with anterior division less sharply marked off from posterior; three posterior segments very large and broad. Caudal segment semioval. Mandibles with molar expansion; cutting edge divided into strong teeth. First pairs of legs shorter than three succeeding pairs, which are subequal and very much elongated. Dactylus distinct on natatory legs. Uropoda biramous, branches single jointed.. 57. *Eurycope.*

a′. Head very large and broad, transversely truncated in front, lateral parts greatly expanded. First four thoracic segments slightly excavated transversely. Superior antennæ with flagellum not much elongated. First two pairs of natatory legs of similar structure, carpal joint large and expanded, cordiform; last pair much narrower than two succeeding pairs, carpal joint but slightly expanded. Caudal segment triangular in form .... 58. *Ilyarachna.*

56. MUNNOPSIS M. Sars.

134. MUNNOPSIS TYPICA M. Sars.

Munnopsis typica M. SARS, Chr. Vid. Selsk. Forh., 1860, p. 84, 1861; Christ. Fjord Fauna, 1868, p. (70), pls. VI, VII, figs. 101–138; Chr. Vid. Selsk. Forh., 1868, p. 261, 1869.—G. O. SARS, Chr. Vid. Selsk. Forh., 1863, p. 206, 1864; Reise ved Kyst. af Christ., 1866, p. (5); Christ. Fjord Dybvands-fauna, 1869, p. (44); Chr. Vid. Selsk. Forh., 1872, p. 79, 1873; Arch. Math. Nat., II, 1877, p. 353 (253).—BUCHHOLZ, Zweite Deutsche Nordpolfahrt, Crust., 1874, p. 285.—HELLER, Denksch. Acad. Wiss. Wien, XXXV, 1875, p. (14) 38.—NORMAN, Proc. Royal Soc., XXV, 1876, p. 208.—MIERS, Ann. Mag. Nat. Hist. (4), XX, 1877, p. 65.—HARGER, Proc. U. S. Nat. Mus., II, 1879, p. 159; Report U. S. Commissioner of Fish and Fisheries, 1880, Pt. 6, pp. 330–332, pl. II, fig. 11.—AXEL OHLIN, Bidrag till Kannedomen om Malakostrakfaunan i Baffin Bay och Smith Sound, 1895, p. 18 (see Harger for synonymy).

Habitat.—Bay of Fundy; Gulf of St. Lawrence; Baffin Bay; Davis Straits; Murchison Sound; 72° 8′ N. lat., 74° 20′ W. long.; 71° 57′ N. lat., 73° 56′ W. long.; Cape Napoleon, Grinnell Land; between Norway and Iceland; Christiania fiord; Christiania Sound; off Storeggen; Loffoden Islands; coast of Finmark; Spitzbergen; Arctic Ocean; Kara Sea.

Depth.—5 to 122 fathoms.

37. EURYCOPE G. O. Sars.

ANALYTICAL KEY TO THE SPECIES OF EURYCOPE.

a. Front of head produced to an acute rostriform projection. Base of head without short transverse ridge. First, second, third, and fourth segments smooth, and produced on each side to acute, anteriorly pointed lappets. Three posterior segments smooth, with antero-lateral angles acutely produced. Caudal segment large, semioval in form, edges evenly curved, and perfectly smooth.
135. *Eurycope cornuta* G. O. Sars.

a′. Front of head has appearance of rostral point caused by frontal margin extending between antennulæ. Base of head with short transverse, tubercular ridge; two oblong, low tubercles situated behind peduncles of antennulæ. First segment of thorax with transverse groove. Second, third, and fourth segments have deep transverse depressions, with a sharp spine on anterior portion of each segment, and a compressed protuberance on the posterior portion. Antero-lateral angles of each of these segments produced in short, sharp spines. Epimera of first segment has a single spine, of three following segments two spines each. Three posterior segments of thorax have each two spines, one on either side of median line. Spine at base of abdomen. At extremity of terminal segment is spine, on either side of which is a lateral triangular spine.
136. *Eurycope caribbea* Benedict, new species.

135. EURYCOPE CORNUTA G. O. Sars.

Eurycope cornuta G. O. Sars, Chr. Vid. Selsk. Forhandl., 1863, p. 5.
Eurycope robusta Harger, Am. Jour. Sci., XV, 1878, p. 375; Proc. U. S. Nat. Mus., II, 1879, p. 159; Report U. S. Commissioner of Fish and Fisheries, 1880, Pt. 6, pp. 332-334, pl. III, fig. 15.
Eurycope cornuta G. O. Sars, Crust. of Norway, II, Pts. 9, 10, 1897, p. 145.

Habitat.—Gulf of St. Lawrence; Atlantic coast of North America; also coast of Norway; Skagerak; Greenland; Kara Sea.

Depth.—119 to 220 fathoms.

136. EURYCOPE CARIBBEA Benedict, new species.[1]

The head is much wider than long. From the point between the antennulæ a depression curves backward and outward to the post lateral margin. On the base of the head is a short, transverse, tubercular ridge. Two oblong, low tubercles are situated closely behind the peduncles of the antennulæ. The sides of the head are swollen. The peduncles of the antennæ and antennulæ occupy a space inclosed by the front and sides of the head; the margin surrounding these appendages is strongly raised.

The front of the head running between the antennulæ has the appearance of a rostral point; here the raised margins unite in the narrowest place and then immediately diverge and extend downward perpendicularly and around underneath the appendages, where they meet and lap with the produced and bent antero-lateral projections. The first joint of the peduncles of the antenna is very stout, with

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[1] The description that follows is from Dr. Benedict's manuscript.

numerous depressions and prominences; the fourth segment is very long; the terminal portions are broken in all the specimens. The first joint of the peduncle of the antennula is excavated on one side to receive the curvature of the antennal peduncle; the other segments of the peduncle are very small; the flagellum is long and slender, with a great number of articles.

The first segment of the thorax is very narrow; nearly the whole surface is occupied by a transverse groove; on the median line and posterior ridge is a prominent granule; the antero-lateral angles of this segment are rounded. The second, third, and fourth segments are also short and have deep transverse depressions which are much narrower than the one in the first segment; on the median line of these segments the space between the groove or depression and the anterior margin is occupied by the compressed base of a sharp spine which is

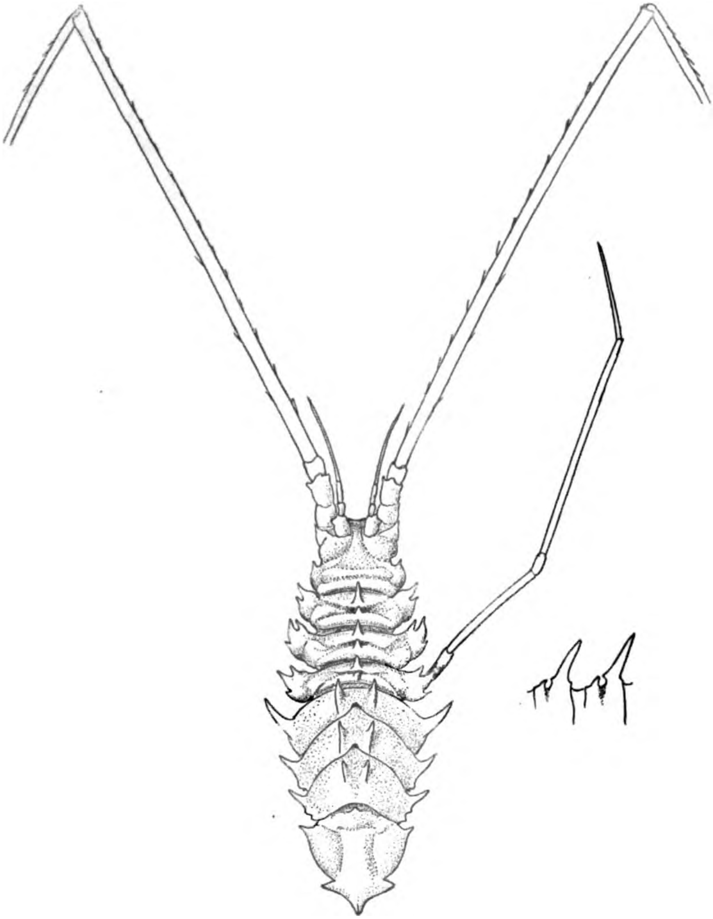

FIG. 29.—EURYCOPE CARIBBEA BENEDICT.

directed forward; between the depression and the posterior margin is a compressed protuberance; between the protuberances the transverse groove runs as a narrow cut rounded and enlarged at the bottom. The antero-lateral angles of the second, third, and fourth segments are produced forward in short, sharp spines.

The epimera of the four anterior segments have projecting spines: the first having a single spine, the other three having two spines each. The three posterior segments of the thorax are very much the same as in *E. fragilis;* the spines on either side of the median line decrease in size successively.

The spine on the base of the abdomen is short; there are two conspicuous granules nearly in the center and bottom of the two longitudinal depressions. The extremity of the abdomen is formed by a decurved spine; the upper surface of the spine is concave; on either side of the base of the terminal spine is a lateral triangular spine; these lateral spines do not in any measure curve forward, as is the case with *E. fragilis.*

On the median line of the ventral surface of the thorax there is a sharp, curved spine on the first segment, prominent longitudinal ridges on the second, third, and fourth segments, and a spiny tubercle followed by four longitudinal ridges. The ridges are separated by transverse grooves on the coalesced fifth, sixth, and seventh segments.

Habitat.—Windward Islands, West Indies.

Depth.—687 fathoms.

Type.—Cat. No. 23911, U.S.N.M.

58. ILYARACHNA G. O. Sars.

137. ILYARACHNA HIRTICEPS G. O. Sars.

Ilyarachna hirticeps G. O. Sars, Forh. Vid. Selsk. i Christiania 1869, p. 167, 1870.—Hansen, Vid. Medd. naturh. Foren i Kjoebh, 1887, p. 195.

Habitat.—66° 32′ N. lat., 55° 34′ W. long.; 71° 10′ N. lat., 58° 56′ W. long.; 72° 41′ N. lat., 59° 50′ W. long. (Greenland).

Depth.—100 to 227 fathoms.

V. ONISCOIDEA.

ANALYTICAL KEY TO THE FAMILIES OF ONISCOIDEA.

a. Inner antennæ with one to two articles. Pleopoda in five pairs; those of first pair wanting; those of the second, third, fourth, and fifth segments have a single branch, all branchial; the branch of the first segment, however, in the male, is produced on the inside in a long compressed stylet; pleopoda of the sixth segment form an inferior operculum.

Family XVIII. Tylides (p. 561).

a.′ Inner antennæ with three articles. Pleopoda in six pairs, all double branched. External branch of the first five pairs opercular in character. Internal branch branchial, in the male, however, of the first and second pairs sexual.

b. Buccal mass not very prominent below. First maxillæ have two plumose setæ on the inner plate. Mandibles with molar expansion obsolete, without any triturating surface, it being replaced by brushlike recurved setæ.

c. External antennæ generally long, close together, with antennal openings large. Body as a rule scarcely able to be contracted into a ball. Head less manifestly immersed in first thoracic segment. Lateral parts of the head separated by a vertical marginal and inframarginal line. Clypeus arched. Legs generally long. Uropoda produced, reaching beyond the terminal segment of the abdomen and the preceding segment. Terminal segment narrower than preceding ones and usually conically produced at end. Family XIX. ONISCIDÆ (p. 561).

c′. External antennæ generally short, with antennal openings small. Body able to be contracted into a ball. Head immersed in first thoracic segment. Lateral parts of the head undifferentiated. Clypeus perpendicular. Legs generally short. Uropoda short, not reaching beyond the terminal segment of the abdomen or the preceding segment. Terminal segment short and broad ....Family XX. ARMADILLIDIDÆ (p. 569).

b′. Buccal mass prominent. First maxillæ have three plumose setæ on the inner plate. Mandibles with molar expansion large and broad, exhibiting a finely fluted triturating surface.

c. Head without any lateral lobes, frontal part rounded. Eyes well developed or wanting. Inner antennæ with last joint very small and without distinctly developed sensory filaments. Posterior maxillæ with two thick hairy bristles. Maxillipeds with terminal part distinctly five-articulate, masticatory lobe truncate at tip, epignath short. External sexual appendages in male double. Inner branches of first pair of pleopoda of a similar structure in both sexes, that of second pair in male terminating in long stylet. Both branches of uropoda styliform ....Family XXI. LIGIIDÆ (p. 574).

c′. Head with distinct, though not very large, lateral lobes, front more or less produced. Eyes small or wanting. Inner antennæ with last joint well developed and tipped with a number of delicate sensory filaments. Posterior maxillæ without any bristles. Maxillipeds with terminal part generally imperfectly articulated, masticatory lobe terminating in a thin lash, epignath narrow, linguiform. Sexual appendage of male simple; inner branch of both first and second pairs of pleopoda transformed for copulative purposes. Uropoda with branches conically tapered. Family XXII. TRICHONISCIDÆ (p. 575).

Family XVIII. TYLIDES.

59. TYLOS Latreille.

138. TYLOS NIVEUS Budde-Lund.

Tylos niveus BUDDE-LUND, Crust. Isop. Terrestria, 1885, pp. 278, 279.

Habitat.—Key West, Florida.

Family XIX. ONISCIDÆ.

ANALYTICAL KEY TO THE GENERA OF ONISCIDÆ.

a. External opercular ramus of the abdominal appendages containing no special respiratory organ. Flagellum of external antennæ triarticulate.

b. Epimera of thoracic segments large, with all the posterior angles acute. Abdomen not abruptly narrower than thorax. First two abdominal segments very short, three following ones large, with large acute epimera.

c. Terminal segment of body conically produced. Basal joint of uropoda oblong. Inner branches not contiguous along their inner lateral margins.
60. *Oniscus*.

c′. Terminal segment of body short, widely rounded posteriorly. Basal joint of uropoda broadly expanded inside. Inner branches contiguous along their inner lateral margins........................ 61. *Synuropus*, new genus.

b′. Epimera of thoracic segments small. Abdomen abruptly narrower than thorax; first two segments generally equal in length to those following; epimera very small, but manifest........................ 62. *Philoscia*.

a′. External opercular ramus of the first and second pairs of abdominal appendages furnished with tracheæ.

b. Flagellum of external antennæ biarticulate.

c. Abdomen not abruptly narrower than thorax. Epimera of abdominal segments large.

d. Body very convex, capable of being rolled up into a perfect ball. Articles of flagellum of external antennæ subequal. Last abdominal segment reaching very little beyond the epimera of the preceding segment. External branches of the uropoda equal in both sexes. External opercular ramus of all the abdominal appendages furnished with tracheæ.
63. *Cylisticus*.

d′. Body more or less depressed, with lateral parts lamellarly expanded. Articles of flagellum of external antennæ with the first article generally longer than the second, often subequal, or even a little shorter. Last abdominal segment generally not reaching beyond the epimera of the preceding segment. External branches of the uropoda longer in the male than in the female. External opercular ramus of the first and second pairs of abdominal appendages, and in some species of all the pairs, furnished with tracheæ........................ 64. *Porcellio*.

c′. Abdomen abruptly narrower than thorax. Epimera of abdominal segments small.

d. First article of flagellum of external antennæ generally longer than second. Last abdominal segment reaches sufficiently beyond the epimera of the preceding segment. External opercular ramus of the first and second pairs of abdominal appendages, rarely of the third or of all the pairs, furnished with tracheæ........................ 65. *Metoponorthus*.

d′. Flagellum of external antennæ with the first article shorter than the second. Last abdominal segment reaches much beyond the epimera of the preceding segment. External opercular ramus of the first and second pairs of abdominal appendages furnished with tracheæ.... 66. *Rhyscotus*.

b′. Flagellum of external antennæ quadri-articulate........... 67. *Acanthoniscus*.

60. ONISCUS Linnæus.

ANALYTICAL KEY TO THE SPECIES OF ONISCUS.

a. Caudal segment a little shorter than inner branches of the uropoda.
139. *Oniscus asellus* Linnæus.

a′. Caudal segment exactly equal to the inner branch of the uropoda.
140. *Oniscus affinis* Say.

139. ONISCUS ASELLUS Linnæus.

Oniscus asellus Linnæus, Fauna Suecica, 2d ed, p. 500.

Oniscus murarius Cuvier, Jour. Hist. Nat., II, p. 23, pl. XXVI, figs. 11–13.—Budde-Lund, Crust. Isop. Terrestria, 1885, pp. 202–204.

Oniscus asellus G. O. Sars, Crust. of Norway, II, Pts. 9, 10, 1897, p. 171, 172.

Habitat.—Greenland; North America at Woods Hole, Massachusetts, and Providence, Rhode Island; also Sweden; Denmark; Germany; Holland; Great Britain; France; Spain; Italy; Azores; Iceland; and coast of Norway.

140. ONISCUS AFFINIS Say.

Oniscus affinis SAY, Jour. Ac. Nat. Sci. Phila., I, 1818, p. 430–431.
Oniscus vicarius STUXBERG, Öfvers. Svenska Vet. Acad. Forh., 1872, Pt. 9, p. 3, and 1875, Pt. 2, p. 50.

Habitat.—North America.

61. SYNUROPUS, new genus.

Body oval, not contractile into a ball, with the segments laterally expanded, as in *Oniscus.*

Head with lateral and frontal lobes. Antennæ with flagellum containing three joints.

Abdomen not narrower than thorax; abdominal epimera large.

Terminal segment of body much broader than long, widely rounded posteriorly, not conically produced as in *Oniscus.* Basal joint of the uropoda large, broadly expanded inside, not oblong as in *Oniscus;* inner branches close together, their internal lateral margins contiguous. Outer branch somewhat longer than inner branch.

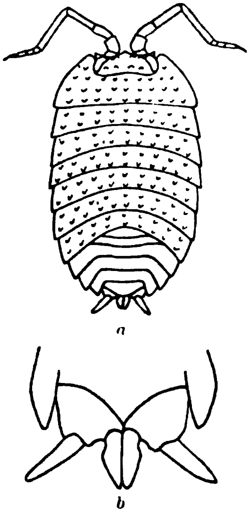

FIG. 30.—SYNUROPUS GRANULATUS. *a*, DORSAL VIEW; *b*, UROPODA.

141. SYNUROPUS GRANULATUS, new species.

Body oval, not able to be contracted into a ball, with the lateral parts of the segments expanded.

Entire surface of body covered with small tubercles.

Head deeply set in first thoracic segment, whose rounded anterior angulations reach the antero-lateral angles of the head. The anterior margin of the head is produced in an obtusely pointed median lobe. The lateral lobes are very acute. The antennæ are geniculate at the articulation of the fourth and fifth peduncular joints; the flagellum contains three joints.

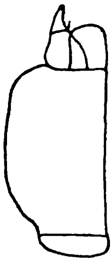

FIG. 31.—MAXILLIPED.

The first thoracic segment is longest; the others subequal. The abdomen is not narrower than the thorax. The first two segments have their lateral margins concealed. The following three have their lateral margins broadly expanded. The terminal segment is twice as broad as long, with the posterior margin broadly rounded. The basal joints of the uropoda are large, being partly covered by the terminal segment of the body. The outer branch is styliform and extends its entire length beyond the terminal abdominal segment. The inner branches are situated close together in such a way that the inner lateral margins are continuous throughout their length.

The legs are ambulatory, similar, and subequal.

Color brown, mottled with black.

One specimen was collected by Dr. L. Stejneger at El Yunque, Porto Rico, at an altitude of 2,800 feet.

Type.—Cat. No. 23912, U.S.N.M.

62. PHILOSCIA Latreille.

ANALYTICAL KEY TO THE SPECIES OF PHILOSCIA.

a. Body smooth, without spines.
  b. Terminal segment of body broadly rounded posteriorly. 142. *Philoscia richmondi*, new species.
  b′. Terminal segment of body posteriorly triangular, with apex more or less produced.
    c. Body striped with two broad dorsal bands........ 143. *Philoscia vittata* Say.
    c′. Body not striped, but spotted with numerous spots.
      d. Frontal marginal line straight, color varying from black to brown, with white spots........................ 144. *Philoscia nigricans* Budde-Lund.
      d′. Frontal marginal line produced in the middle, a little arcuate, color violet, with white spots............ 145. *Philoscia brevicornis* Budde-Lund.
a′. Body with numerous spines above................. 146. *Philoscia spinosa* Say.

142. PHILOSCIA RICHMONDI, new species.

Body oval; surface smooth. Head not set in first thoracic segment, evenly rounded, with no lateral or frontal lobes. Eyes large, well developed, lateral. Antennæ equal to half the length of the body; flagellum composed of three joints.

Segments of thorax subequal.

Abdomen abruptly narrower than thorax, with the lateral processes of the segments not projecting. Terminal segment equal in length to the preceding segment, much broader than long, and with the posterior margin broadly rounded. The basal joint of the uropoda projects beyond the terminal segment of the body. The inner branch extends to the middle of the outer branch.

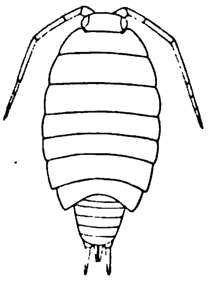
FIG. 32.—PHILOSCIA RICHMONDI.

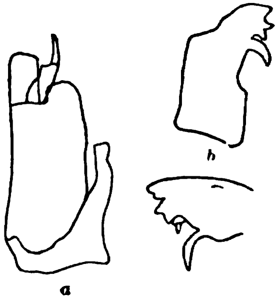

FIG. 33.—*a*, MAXILLIPED; *b*, MANDIBLE.

Legs gradually increasing in length.

Color, mottled brown and yellow.

A number of specimens were collected by Dr. C. W. Richmond and Dr. L. Stejneger at El Yunque, Porto Rico, at an altitude of 2,800 feet.

Type.—Cat. No. 23913, U.S.N.M.

143. PHILOSCIA VITTATA Say.

Philoscia vittata SAY, Jour. Acad. Nat. Sci. Phila., I, 1818, p. 429.—DE KAY, Zool. N. Y. Crust., 1844, p. 50.—WHITE, List Crust. Brit. Mus., 1847, p. 99.—HARGER, Rep. U. S. Fish Comm., Pt. 1, for 1874, p. 569 (275); Proc. U. S. Nat. Mus., II, 1879, p. 157; Rep. U. S. Fish Comm., 1880, Pt. 6, p. 306–307, pl. I, fig. 1. (See Harger for synonymy.)

Habitat.—Great Egg Harbor, New Jersey, to Barnstable, Massachusetts.

Budde-Lund[1] suggests that this species is very likely not distinct from *P. muscorum.*

144. PHILOSCIA NIGRICANS Budde-Lund.

Philoscia nigricans BUDDE-LUND, Crust. Isop. Terrestria, 1885, pp. 210, 211.

Habitat.—Biloxi, Mississippi.

145. PHILOSCIA BREVICORNIS Budde-Lund.

Philoscia brevicornis BUDDE-LUND, Crust. Isop. Terrestria, 1885, pp. 218, 219.

Habitat.—Biloxi, Mississippi.

146. PHILOSCIA SPINOSA Say.

Philoscia spinosa SAY, Jour. Ac. Nat. Sci. Phil., I, 1818, pp. 429, 430.

Habitat.—Savannah, Georgia.

63. CYLISTICUS Schnitzler.

147. CYLISTICUS CONVEXUS (De Geer).

Oniscus convexus DE GEER, Mém. des Insectes, VII, p. 553, pl. XXXV, fig. 11.
Porcellio spinifrons BRANDT, Bull. de la Soc. Imp. d. Naturalistes de Moscou, VI, 1833, p. 15.
Porcellio lævis KOCH, Deutschl. Crust., p. 6.
Porcellio armadilloides LEREBOULLET, Mém. de la Soc. du Muséum d' Histoire Nat. de Strasbourg, IV, 1853, p. 65, pl. I, fig. 18; pl. III, figs. 88–94.
Cylisticus lævis SCHNITZLER, De Onisc., 1853, p. 25.
(?) *Cylisticus spinifrons* SCHNITZLER, De Onisc., 1853, p. 25.
(?) *Porcellio glaber* FITCH, Rep. Noxious Ins., p. 119.
Porcellio armadilloides KINAHAN, Dubl. Nat. Rev., IV, p. 279.
Porcellio lævis AM. STEIN, Jahresbericht d. Natur. Forschenden Gesellschaft Graubündens, 1857, p. 112.
Porcellio convexus JOHNSON, Sver. Onisc., 1858, p. 32.
Porcellio armadilloides BATE and WESTWOOD, Brit. Sessile-eyed Crust., II, p. 485.
Porcellio convexus BUDDE-LUND, Nat. Tidsskr., (3), VII, p. 240.
Porcellio convexus STUXBERG, Öfvers. af Kgl. Vetenskaps Akad. Förh., 1875, p. 60.

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[1] Crust. Isop. Terrestria, 1885, p. 209.

Cylisticus convexus Budde-Lund, Crust. Isop. Terrestria, 1885, pp. 77–79 (see Budde-Lund for synonymy).—G. O. Sars, Crust. of Norway, II, pls. xi, xii, 1897, p. 186.

Habitat.—North America; also Sweden; Denmark; British Isles; Germany; Bohemia; Holland; Belgium; France; Turkey; and coast of Norway.

64. PORCELLIO Latreille.

ANALYTICAL KEY TO THE SPECIES OF PORCELLIO.

a. Surface of body smooth. Inner face of the right mandible with six to seven penicils, of the left mandible with seven to nine penicils. Frontal lateral lobes of head of moderate size, rounded....... 148. *Porcellio lævis* Latreille.

a'. Surface of body roughly granulate or tuberculate.

- *b.* Inner face of the mandibles with four to five penicils. Body with spots.
  - *c.* Third joint of peduncle of second pair of antennæ furnished with a small apical tooth. Frontal lateral lobes of moderate size. Color varying from gray to black, with three longitudinal lines of white spots. Flagellum with joints subequal, or first shorter than second......... 149. *Porcellio rathkei* Brandt.
  - *c'.* Second joint of peduncle of second pair of antennæ furnished with large apical tooth. Frontal lateral lobes large. Color, yellow; body spotted with black; spots arranged in longitudinal lines. Flagellum with first joint a little longer than second joint..................... 150. *Porcellio spinicornis* Say.
- *b'.* Inner face of right mandible with four to five penicils, of left mandible with seven to eight penicils. Frontal lateral lobes of head large, oblique. Body without spots............................ 151. *Porcellio scaber* Latreille.

148. PORCELLIO LÆVIS Latreille.

Porcellio lævis Latreille, Hist. Crust. Ins., VII, p. 46; Gen. Crust., I, p. 71.—Leach, Edinb. Encycl., VII, p. 406; Transact., XI, p. 375.

Oniscus lævis Lamarck, Hist. Nat. An. s. Vert., V, p. 154; 2d ed., V, p. 261.

(?) *Porcellio lævis* Risso, Crust. Nice, p. 156; Hist. Nat., pp. 119, 163.—Desmarest, Consid., p. 321.

(?) *Porcellio degeerii* Audouin and Savigny, Descript. de l'Égypte, p. 289, pl. xiii, fig. 5.

Porcellio eucercus Brandt, Bull. Soc. Imp. d. Moscou, VI, 1833, p. 177.—Milne-Edwards, Hist. Nat. des Crust., III, p. 168.

Porcellio syriacus Brandt, Bull. Soc. Imp. d. Moscou, VI, 1833, p. 178.—Milne-Edwards, Hist. Nat. des Crust., III, p. 170.

Porcellio musculus Brandt, Bull. Soc. Imp. d. Moscou, VI, 1833.

Porcellio cinerascens Brandt, Bull. Soc. Imp. d. Moscou, VI, 1833, p. 178.

Porcellio dubius Brandt, Bull. Soc. Imp. d. Moscou, VI, 1833, p. 178.—Milne-Edwards, Hist. Nat. des Crust., III, p. 170.

Porcellio poeyi Guérin, Comptes Rendus, 1837, p. 132.

Porcellio lævis Milne-Edwards, Hist. Nat. des Crust., III, p. 169; Règne an., Planch, p. 71 bis, fig. 2.

Porcellio urbicus Koch, Deutsch. Crust., p. 36.

Porcellio degeerii Brandt, Wagner Reise Alg., III, 1836, p. 278.

Porcellio ovatus Zaddach, Synops., p. 13.

Porcellio flavipes Koch, Berichtig, etc., p. 206, pl. viii, fig. 97.

Porcellio degeerii Lucas, Expl. d'Alg., I, pp. 69, 139.

Porcellio lævis Lereboullet, Mém. de la Soc. de Strasbourg, IV, p. 45, pl. i, fig. 7; pl. iii, figs. 55–60.

Porcellio poeyi Guérin, Ramon de la Sagra, Crust., p. 67.—Saussure, Mém. Soc. phys. Genève, XIV, 1858, p. 477, pl. v, fig. 34.

Porcellio cubensis SAUSSURE, Mém. Soc. phys. Genève, XIV, 1858, p. 477, pl. v, fig. 35.
Porcellio sumichrasti SAUSSURE, Mém. Soc. phys. Genève, XIV, 1858, p. 478, pl. v, fig. 36.
Porcellio cotillæ SAUSSURE, Mém. Soc. phys. Genève, XIV, 1858, p. 478, pl. v, fig. 37.
Porcellio mexicanus SAUSSURE, Mém. Soc. phys. Genève, XIV, 1858, p. 479, pl. v, figs. 39, 40.
Porcellio aztecus SAUSSURE, Mém. Soc. phys. Genève, XIV, 1858, p. 479, pl. v, fig. 38.
Porcellio interruptus HELLER, Verh. Zool. Bot. Ges. Wien, XI, p. 495; Novara Exp., p. 136, p. 12, fig. 6 (not adult).
Porcellio lævis PLATEAU, Crust. Isop., p. 10.—BUDDE-LUND, Nat. Tidsskrift., 3d ser., VII, p. 236.
Porcellio aztecus MIERS, Proc. Zool. Soc. Lond., 1877, p. 669.
Porcellio lævis ULJANIN Crust. Turkest., p. 17, pl. 4, figs. 1–10.—BUDDE-LUND, Crust. Isop. Terrestria, 1885, pp. 138–141. (See Budde-Lund for synonymy.)

Habitat.—Distribution world-wide.

149. PORCELLIO RATHKEI Brandt.

Porcellio rathkei BRANDT, Bull. de la soc. Imp. d. Naturalistes de Moscou, VI, 1833, p. 15.—MILNE-EDWARDS, Hist. des Crust., III, p. 170.
Porcellio ferrugineus BRANDT, Bull. de la soc. Imp. d. Naturalistes de Moscou, VI, 1883, p. 16.—MILNE-EDWARDS, Hist. des Crust. III, p. 170.
Porcellio trilineatus KOCH, Deutschl. Crust., p. 34.
Porcellio trivittatus LEREBOULLET, Mém. de la Soc. de muséum nat. de Strasbourg, IV, 1853, p. 54, pl. I, figs. 13, 14; pl. III, figs. 66–70.
Porcellio tetramoerus SCHNITZLER, De Onisc, p. 24.
Porcellio striatus SCHNITZLER, De Onisc, p. 24.
Porcellio trilineatus SILL, Verhandl. u. Mittheilungen des Siebenbürgeschen Vereins für Naturwissenschaften zu Hermannstadt, XIII, 1862, p. 26.
Porcellio trivittatus JOHNSON, Sver. Onisc., p. 25.
Porcellio trilineatus BUDDE-LUND, Nat. Tidsskr. (3), VII, p. 239.—STÜXBERG, Ofvers. af Kgl. Vetenskaps Akad. Forh., 1875, p. 59.
Porcellio rathkei BUDDE-LUND, Crust. Isop. Terrestria, 1885, pp. 85–87. (See Budde-Lund for synonymy.)

Habitat.—East coast of North America; Syracuse, New York; Providence, Rhode Island; Lawrence, Massachusetts; also Europe.

150. PORCELLIO SPINICORNIS Say.

Porcellio spinicornis SAY, Jour. Ac. Nat. Sci. Phila., I, 1818, pp. 431, 432.
Porcellio pictus BRANDT and RATZEBURG, Med. Zool., II, p. 78, pl. XII, figs. 5, 5e, 5f.
Porcellio melanocephalus KOCH, Deutschl. Crust., p. 28.
(?) *Porcellio spinicornis* DE KAY, Zool. N. York, VI, p. 51.
Porcellio mixtus FITCH, Rep. noxious ins., p. 120.
Porcellio pictus KINAHAN, Nat. Hist. rev., IV, p. 278.—BATE and WESTWOOD, Brit. Sess. Crust., II, p. 480.—BUDDE-LUND, Nat. Tidsskr. (3), VII, p. 239; Crust. Isop. Terrestria, 1885, pp. 123–125.—G. O. SARS, Crust. of Norway, II, Pts. 9, 10, 1897, pp. 177, 178.

Habitat.—North America, at New York, Niagara; Goshen, Connecticut; also Sweden; Denmark; Germany; Britain; France; Hungary; Russia; coast of Norway.

151. PORCELLIO SCABER Latreille.

Porcellio scaber LATREILLE, Hist. Crust. Ins., VII, p. 45; Gen. Crust., I, p. 70.—LEACH, Edin. Encycl., VII, p. 406.

Oniscus granulatus LAMARCK, Hist. Nat. des. Animaux sans Vertèbres, V, p. 154; 2d ed., V, p. 261.

Porcellio scaber RISSO, Crust. de Nice, p. 155; Hist. Crust., p. 119.

Porcellio nigra SAY, Journ. Acad. Nat. Sci., Phila., I, 1818, p. 432.

Porcellio granulatus BRÉBISSON, Mém. Soc. Calv., 1825, p. 261.

Porcellio scaber DESMAREST, Consid. Crust., p. 321.—BRANDT and RATZEBURG, Med. Zool., II, p. 77, pl. XII, figs. 1–4 and A–B.—BRANDT, Bull. Soc. Imp. d. Naturalistes de Moscou, VI, 1833, p. 176.

Porcellio brandtii MILNE-EDWARDS, Hist. Nat. des Crust., III, p. 168.

Porcellio granulatus MILNE-EDWARDS, Hist. Nat. des Crust., III, p. 169, pl. XXXII. fig. 21.

Porcellio scaber MILNE-EDWARDS, Cuvier Rg. An., 1849, pls. LXXI–LXXI bis.

Porcellio nigra GOULD, Rep. Crust., p. 337.

Porcellio scaber KOCH, Deutschland's Crust., p. 34.

Porcellio dubius KOCH, Deutschland's Crust., p. 34.

Porcellio asper KOCH, Berichtig., p. 207, pl. VIII, fig. 98.

Porcellio scaber LEREBOULLET, Mém. Strasb., IV, p. 34, pl. I, figs. 4, 5; pl. II, figs. 43–47.

Porcellio gemmulatus DANA, Crust. U. S. Expl. Exp., 1853, p. 725, pl. XLVII, fig. 7.—STIMPSON, Journ. Bos. Soc. Nat. Hist., VI, p. 66.

Philoscia tuberculata STIMPSON, Proc. Cal. Acad. Sci., I, p. 89.

Porcellio scaber SILL, Crust. Lieb., 1861, p. 3.—BATE and WESTWOOD, Brit. Crust., II, p. 475.

Porcellio paulenses HELLER, Novara Exp., p. 136, pl. XII, fig. 5.

Porcellio scaber PLATEAU, Bull. Acad. Belgique, 2d ser., XXIX, 1870, No. 2, p. 8.—E. BRANDT, Horæ Soc. Ent. Rossi, VIII, p. 167.—BUDDE-LUND, Nat. Tidsskrift., 3d ser., VII, p. 238; Prospectus, p. 3.—BOS, Crust. Hedrioph. Nederl., pp. 38, 91.—BUDDE-LUND, Crust. Isop. Terrestria, 1885, pp. 129–131. (See Budde-Lund for synonymy.)

Habitat.—Greenland; Newfoundland; Grand Manan; Lawrence, Massachusetts; West Haven, Connecticut; New York; Ocean Grove, New Jersey; Woodside, Maryland; Bloomington, Illinois; Niagara; San Francisco and Colfax, California; San Pedro, Mexico; St. Paul Island; St. Croix; Ascension Island; also Kamchatka; Iceland; Cape of Good Hope; all Europe.

63. METOPONORTHUS Budde-Lund.

ANALYTICAL KEY TO THE SPECIES OF METOPONORTHUS.

a. Inner face of right mandible with four to five penicils, of left mandible with six penicils. Second and third joints of peduncle of second pair of antennæ furnished with a small apical tooth; first joint of flagellum much longer than second joint. No middle frontal lobe. Color, brown or reddish brown.
152. *Metoponorthus pruinosus* (Brandt).

a'. Inner face of right mandible with four penicils, of left mandible with five penicils. Second and third joints of peduncle of second pair of antennæ without small apical tooth; first joint of flagellum shorter than second. Middle frontal lobe small, widely rounded. Color from gray to black, with three longitudinal lines of white spots.... 153. *Metoponorthus virgatus* Budde-Lund.

152. METOPONORTHUS PRUINOSUS (Brandt).

(?) *Asellus minor* H. Sloane, Voyage to Jamaica, Lond., II, 1725, p. 199.
Porcellio pruinosus Brandt, Bull. de la Soc. Imp. d. Naturalistes de Moscou, p. 19.
(?) *Porcellio truncatus* M. Edwards, Hist. des Crust., III, p. 171.
Porcellio maculicornis Koch, Deutschl. Crust., p. 34.
Porcellio frontalis Lereboullet, Mém. Clop., p. 63, pl. i, fig. 17; pl. iii, figs. 81–87.
Porcellio zealandicus White, List. Crust. Brit. Mus., 1847, p. 99.
(?) *Porcellio immaculatus* Fitch, Rep. Nox. Ins., p. 120.
Porcellionides flavo-vittatus Miers, Proc. Zool. Soc. Lond., 1877, p. 669, pl. lxviii, fig. 4.
(?) *Porcellio jelskii* Miers, Proc. Zool. Soc., Lond., 1877, p. 668, pl. lxviii, fig. 3.
Metoponorthus pruinosus Budde-Lund, Crust. Isop. Terrestria, 1885, pp. 169–171. (See Budde-Lund for synonymy.)

Habitat.—North and South America; Europe; North Africa, etc.

153. METOPONORTHUS VIRGATUS Budde-Lund.

Metoponorthus virgatus Budde-Lund, Crust. Isop. Terrestria, 1885, p. 182.

Habitat.—Florida; Nova Aurelia.

66. RHYSCOTUS Budde-Lund.

154. RHYSCOTUS TURGIFRONS (Budde-Lund).

Stenomacrus turgifrons Budde-Lund, Prosp., p. 5.
Rhyscotus turgifrons Budde-Lund, Crust. Isop. Terrestria, 1885, p. 192.

Habitat.—St. Jean, West Indies.

67. ACANTHONISCUS (White) Kinahan.

155. ACANTHONISCUS SPINIGER White.

Acanthoniscus spiniger White, List. Crust. Brit. Mus., 1847, p. 99.—Gosse, A Naturalist's Sojourn in Jamaica, Lond., 1851, p. 65.—Kinahan, Proc. Dubl. Univ., I, p. 197, pl. xix, fig. 4.—Budde-Lund, Crust. Isop. Terrestria, 1885, pp. 241, 242.

Habitat.—Jamaica.

Family XX. ARMADILLIDIDÆ.

ANALYTICAL KEY TO THE GENERA OF ARMADILLIDIDÆ.

a. Outer branch of the uropoda very small or minute. Basal joint large.
  b. Flagellum of external antennæ with two or three joints.
    c. Flagellum with two joints.
      d. Eyes small. First thoracic segment with coxopodites not distinct from segments on upper side. Caudal segment posteriorly truncate.
        e. Last abdominal segment subtetragonal, base wider than apex, more or less contracted in the middle. External branch of the uropoda inserted in the middle of the internal lateral margin of the basal joint. Coxopodites of first and second segments not distinct from segments (underside) .... 68. *Cubaris.*

c'. Last abdominal segment trapezoidal or subcordiform, narrower at its truncate apex. External branch of the uropoda inserted in the inner post-lateral angle of the basal joint. Coxopodites of the first and second segments distinct (underside)............ 69. *Pseudarmadillo.*

d'. Eyes large. First thoracic segment with coxopodites well develope and distinct on the upper surface, where they form on each side of the segment a very large marginal border. Caudal segment obtuse and rounded at apex. Basal joint of uropoda occupying all the space between the caudal segment and preceding one. Inner branch does not reach the apex of last segment; outer branch terminal, styliform, and very small.................................. 70. *Mesarmadillo.*

c'. Flagellum with three joints. Coxopodites of first segment usually distinct on underside. Terminal segment of body very short, rounded posteriorly. External branch of the uropoda inserted in the inner post-lateral angle of the quadrangular basal joint, and extends downward. Inner branch reaches much beyond terminal segment of body.
71. *Sphæroniscus.*

b'. Flagellum of external antennæ with a single joint only. Coxopodite distinct on first segment (underside). External branch of the uropoda inserted at inner post-lateral angle of basal joint............ 72. *Haplarmadillo.*

a'. Outer branch of uropoda large, flattened lamellar, inserted at apex of basal joint.
73. *Armadillidium.*

68. CUBARIS Brandt.

ANALYTICAL KEY TO THE SPECIES OF CUBARIS.

a. Body tuberculate.

b. Second thoracic segment without a distinct coxopodite.

c. Coxopodite of first thoracic segment hardly perceptible as a very small process below the leg. Prosepistoma of head with a shield-like convexity. Apex of telson half as wide as basis. Endopodite of the uropoda extending one-half the length of the telson.
156. *Cubaris tenuipunctatus* (Dollfus).

c'. Coxopodite of first thoracic segment hardly perceptible, only a feeble ridge. Prosepistoma of head nearly plain. Apex of telson one-third narrower than basis. Endopodite of the uropoda extending two-thirds the length of the telson............ 157. *Cubaris depressus* (Dollfus).

b'. Second thoracic segment with a distinct coxopodite (underside).

c. Coxopodite of the first thoracic segment distant from the edge, crested, and ended by a tooth-like diverging process.
158. *Cubaris viticola* (Dollfus).

c'. Coxopodite of the first thoracic segment not distant from the edge and not crested.

d. Coxopodite of the first thoracic segment distinct along the entire length of the edge (underside).

e. Coxopodite of the first segment divergent on the half hind part. Coxopodite of the second segment forming a tooth-like diverging process.
159. *Cubaris silvarum* (Dollfus).

e'. Coxopodite of the first segment not divergent. Coxopodite of the second segment large, square-shaped... 160. *Cubaris perlatus* (Dollfus).

d'. Coxopodite of the first thoracic segment not distinct along the entire length of the edge.

e. Coxopodite of the first segment small, dentiform, and very unequally cleft................................ 161. *Cubaris murinus* Brandt.

e'. Coxopodite of the first segment not dentiform, subequally cleft.
162. *Cubaris cinctus* (Dollfus).

a′. Body smooth.
  b. Upper surface of terminal segment of body with a shallow depression on each side, and a small median pit near the base.. 163. *Cubaris gigas* Miers.
  b′. Upper surface of terminal segment of body without shallow depression on each side, or median pit.
    c. Coxopodite distinct on the entire length of the lateral edge of the first thoracic segment (underside).................. 164. *Cubaris zigzag* (Dollfus).
    c′. Coxopodite not distinct on the entire length of the lateral edge of the first thoracic segment.
      d. Second thoracic segment with a large square coxopodite, distinct on its total length (underside)................. 165. *Cubaris dumorum* (Dollfus).
      d′. Second thoracic segment with the coxopodite very small.
        e. Coxopodite of the second segment forming a tooth-like process. Telson with a blunt double tubercle near the base.
166. *Cubaris grenadensis* (Budde-Lund).
        e′. Coxopodite of the second thoracic segment not tooth-like. Telson smooth above.......................... 167. *Cubaris pisum* (Budde-Lund).

156. CUBARIS TENUIPUNCTATUS (Dollfus).

Armadillo tenuipunctatus Dollfus, Proc. Zool. Soc. Lond., 1896, p. 389.

Habitat.—Mustique Island, West Indies.

157. CUBARIS DEPRESSUS (Dollfus).

Armadillo depressus Dollfus, Proc. Zool. Soc. Lond., 1896, p. 390.

Habitat.—St. Vincent, Chateaubelais, West Indies.

158. CUBARIS VITICOLA (Dollfus).

Armadillo viticola Dollfus, Proc. Zool. Soc. Lond., 1896, pp. 396, 397.

Habitat.—Grenada; Balthazar; Chantilly, West Indies.

159. CUBARIS SILVARUM (Dollfus).

Armadillo silvarum Dollfus, Proc. Zool. Soc. Lond., 1896, pp. 393, 394.

Habitat.—St. Vincent, Chateaubelais; Cumberland Valley, West Indies.

160. CUBARIS PERLATUS (Dollfus).

Armadillo perlatus Dollfus, Proc. Zool. Soc. Lond., 1896, pp. 395, 396.

Habitat.—St. Vincent, West Indies.

161. CUBARIS MURINUS Brandt.

Cubaris murina Brandt, Bull. de la Soc. Imp. d. Naturalistes de Moscou VI, 1833, p. 28.
Cubaris brunnea Brandt, Bull. de la Soc. Imp. d. Naturalistes de Moscou, VI, p. 28.
Armadillo murinus Milne-Edwards, Hist. des Crust., III, p. 179.
Armadillo brunneus Milne-Edwards, Hist. des Crust., III, p. 179.
Armadillo cubensis Saussure, Mém. de la Soc. de Physique et d'Hist. nat. de Genève, XIV, 1858, Pt. 2, p. 65.
Cubaris affinis Miers, Proc. Zool. Soc., 1877, p. 666, pl. LXVIII, fig. 4.
Armadillo conglobator Budde-Lund, Prosp., p. 7.
Armadillo murinus Budde-Lund, Prosp., p. 7, Crust. Isop. Terrestria, 1885, pp. 27, 28. (See Budde-Lund for synonymy.)

Habitat.—Porto Rico; Cuba; St. Thomas; Jamaica; also Oahu; Brazil; Cayenne; Seychelle Islands; Sumatra.

162. CUBARIS CINCTUS (Dollfus).

Armadillo cinctus DOLLFUS, Proc. Zool. Soc. Lond., 1896, p. 392.

Habitat.—Near Layon, West Indies.

163. CUBARIS GIGAS Miers.

Cubaris gigas MIERS, Proc. Zool. Soc. Lond., 1877, p. 666, pl. LXVIII, fig. 1.
Armadillo gigas BUDDE-LUND, Crust. Isop. Terrestria, 1885, p. 40.

Habitat.—Nicaragua, near San Juan.

164. CUBARIS ZIGZAG (Dollfus).

Armadillo zigzag DOLLFUS, Proc. Zool. Soc. Lond., 1896, pp. 394, 395.

Habitat.—St. Vincent, West Indies.

165. CUBARIS DUMORUM (Dollfus).

Armadillo dumorum DOLLFUS, Proc. Zool. Soc. Lond., 1896, p. 391.

Habitat.—Mustique Island, West Indies.

166. CUBARIS GRENADENSIS (Budde-Lund).

Armadillo grenadensis BUDDE-LUND, Entomol. Meddelel, 1893, p. 115.—DOLLFUS, Proc. Zool. Soc. Lond., 1896, pp. 392, 393.

Habitat.—Becquia Island; Grenada; Balthazar, West Indies.

167. CUBARIS PISUM (Budde-Lund).[1]

Armadillo pisum BUDDE-LUND, Crust. Isop. Terrestria, 1885, p. 32.

Habitat.—Florida.

69. PSEUDARMADILLO Saussure.

168. PSEUDARMADILLO CARINULATUS Saussure.

Pseudarmadillo carinulatus SAUSSURE, Mém. de la Soc. de Physique et d'Hist. nat. de Genève, XIV, 1858, Pt. 2, p. 67, pl. IV, figs. 43, 43a.—BUDDE-LUND, Crust. Isop. Terrestria, 1885, pp. 41, 42.

Habitat.—Mexico or Cuba.

70. MESARMADILLO Dollfus.

ANALYTICAL KEY TO THE SPECIES OF MESARMADILLO.

a. Surface of body smooth, with side parts of thoracic segments (two to seven) and abdominal segments not bent downward.

- *b.* Prosepistoma plain. Coxopodite of second segment of thorax forming a nearly inconspicuous ridge before leg. Caudal segment triangular; apex pointed. Inner branch of uropoda extending beyond apex of caudal segment. 169. *Mesarmadillo modestus* Dollfus.
- *b'.* Prosepistoma with a shield-like convexity. Coxopodite of second segment of thorax hardly visible, only a very small dentiform process before leg. Caudal segment flat, with rounded apex. Inner branch of uropoda reaching two-thirds length of caudal segment........ 170. *Mesarmadillo americanus* Dollfus.

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[1] Budde-Lund says that he is not sure whether any of the specimens which he had examined were adults.

a'. Surface of body slightly granulated, with side parts of thoracic segments (two to seven) and abdominal segments bent downward. Caudal segment with blunt rounded apex. Inner branch of uropoda reaching two-thirds length of caudal segment.................................... 171. *Mesarmadillo reflexus* Dollfus.

169. MESARMADILLO MODESTUS Dollfus.

Mesarmadillo modestus Dollfus, Proc. Zool. Soc. Lond., 1896, p. 397.

Habitat.—St. Vincent, West Indies.

170. MESARMADILLO AMERICANUS Dollfus.

Mesarmadillo americanus Dollfus, Proc. Zool. Soc. Lond., 1896, pp. 397, 398.

Habitat.—St. Vincent, West Indies.

171. MESARMADILLO REFLEXUS Dollfus.

Mesarmadillo reflexus Dollfus, Proc. Zool. Soc. Lond., 1896, pp. 398, 399.

Habitat.—St. Vincent, West Indies.

71. SPHÆRONISCUS Gerstäcker.

172. SPHÆRONISCUS PORTORICENSIS, new species.

Body oblong, very convex, contractile into a ball. Surface perfectly smooth. Head set in first thoracic segment; front straight; epistoma forming a triangular shield. Eyes very small. Antennæ with flagellum containing three joints.

First thoracic segment twice as long as head, and longer than any of the other segments. Coxopodites not distinct from segment.

First two abdominal segments with the lateral parts concealed. The three following ones continuing the outline of the body. The terminal segment is twice as broad as long, very short, widely rounded posteriorly. The basal joints of the uropoda are large, square, extending the greater part of their length beyond the terminal segment. The external branch is inserted at the inner post-lateral angle of the basal joint and extends downward. The internal branch extends much beyond the last abdominal segment, is longer than the basal joint of the uropoda, and reaches the tip of the external branch.

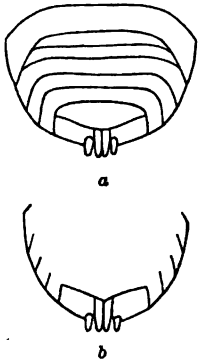

Fig. 34.—Sphæroniscus portoricensis, *a*. Abdomen; *b*. Uropoda (inside).

Color reddish-brown with markings of yellow.

Four specimens were taken by Dr. C. W. Richmond at El Yunque, Porto Rico, at an altitude of 2,800 feet.

Type.—Cat. No. 23914, U.S.N.M.

72. HAPLARMADILLO Dollfus.

173. HAPLARMADILLO MONOCELLATUS Dollfus.

Haplarmadillo monocellatus Dollfus, Proc. Zool. Soc. Lond., 1896, p. 400.

Habitat.—Richmond Valley, St. Vincent, West Indies.

73. ARMADILLIDIUM Brandt.

174. ARMADILLIDIUM VULGARE (Latreille).

Armadillo vulgare LATREILLE, Hist. Crust., VII, p. 48; Gen. Crust., I, p. 71.
Armadillo pilularis SAY, Jour. Ac. Nat. Sci. Phila., I, 1818, p. 432, 433.
Armadillidium commutatum BRANDT and RATZEBURG, Med. Zool., II, p. 81, pl. XIII, figs. 1, 2, 3, A, B.
Armadillo trivialis KOCH, Deutschl. Crust., p. 28.
Armadillo alter SCHNITZLER, De Onisc., p. 26.
Armadillidium vulgare BUDDE-LUND, 1885, pp. 66–68 (see Budde-Lund for synonymy).

Habitat.—Distribution world-wide.

Family XXI. LIGIIDÆ.

74. LIGIA Fabricius.

Both branches of uropoda equal in length, styliform, often filiform. Interior mala of the mandibles with numerous penicils. Last segment of body broad, with distinct epimeral plates. Maxillipeds with palp four to five jointed; epignath rounded.

ANALYTICAL KEY TO THE SPECIES OF LIGIA.

a. External antennæ shorter than body.
  b. Uropoda nearly equal to one-third length of body.
    175. *Ligia oceanica* (Linnæus).
  b′. Uropoda equal to half the length of body.
    176. *Ligia baudiniana* Milne-Edwards.
a′. External antennæ longer than body. Caudal stylets about equal to two-thirds length of body.
  b. Tarsus of first pair of feet in the males with a compressed process at apex.
    177. *Ligia exotica* Roux.
  b′. Tarsus of first pair of feet in males without compressed process at apex, simple.
    178. *Ligia olfersii* Brandt.

175. LIGIA OCEANICA (Linnæus).

Oniscus oceanicus LINNÆUS, Syst. Nat., 12th ed., II, p. 1061; 13th ed., I, Pt. 5, p. 3012.
Cymothoa oceanica FABRICIUS, Mantissa, I, p. 242.
Ligia oceanica FABRICIUS, Suppl. Ent. Syst., p. 301.
Ligia oniscides BREBISSON, Mém. Soc. Lin. Calv., 1825, p. 259.
Ligia oceanica BUDDE-LUND, Crust. Isop. Terrestria, 1885, pp. 259–261.

Habitat.—Off Newport, Rhode Island; North Sea; Baltic Sea; Kattegat Sea; Norway; Færøe Islands; coast of Germany; Belgium; Great Britain; France; Spain; Mediterranean Sea.

Depth.—Littoral.

176. LIGIA BAUDINIANA Milne-Edwards.

Ligia baudiniana MILNE-EDWARDS, Hist. des Crust., III, 1840, pp. 155, 156.—MIERS, Proc. Zool. Soc., 1877, p. 670.
Ligia baudiana IVES, Proc. Ac. Nat. Sci. Phila., 1891, pp. 185–186, pl. VI, fig. 2.

Habitat.—San Juan d'Ulloa, Vera Cruz; Cuba; Yucatan; also Rio Janeiro; Cayenne.

Depth.—Littoral.

177. LIGIA EXOTICA Roux.

Ligia exotica ROUX, Crust. Médit., p. 3, pl. XIII, fig. 9.
(?) *Ligia grandis* PERTY, Spix and Martius, p. 212, pl. XL, fig. 13.
Ligia gaudichaudii MILNE-EDWARDS, Hist. Nat. des Crust., III, p. 157.
(?) *Ligia* (*Italica*) *coriacea* KOCH, Deutsch. Crust., p. 36; Berichtig., p. 211.
Ligia gaudichaudii DANA, Expl. Exp., p. 741, pl. XLIX, figs. 6a–h.—NICOLET in Gay, Hist. Chile, III, p. 265.
Ligia exotica BUDDE-LUND, Crust. Isop. Terrestria, 1885, pp. 266–268.

Habitat.—Cedar Keys, Florida; Key West, Pine Key, Florida; St. Jean d'Allao, Mexico; Topolobampo, Mexico; Panama; Cuba; California; also Chusan; Macao; Rio Janeiro; Bahia; Puntarenas; Chile; Madras; Manila; Luzon; Singapore; Massilia; Espiritu Santo, Balandra Bay, near Point Diablo.

Depth.—Littoral.

178. LIGIA OLFERSII Brandt.

Ligia olfersii BRANDT, Bull. de la Soc. Imp. d. Naturalistes de Moscou, VI, 1833, p. 11.—BUDDE-LUND, Crust. Isop. Terrestria, 1885, p. 268.

Habitat.—Key West, Florida; Punta Rassa, Florida; St. Thomas; Brazil.

Family XXII. TRICHONISCIDÆ.

ANALYTICAL KEY TO THE GENERA OF TRICHONISCIDÆ.

a. Abdomen abruptly narrower than thorax. Head rounded in front, with distinct though small lateral lobes. Terminal abdominal segment truncate at tip .... 75. *Trichoniscus.*
a′. Abdomen not abruptly narrower than thorax.
  b. Head triangularly produced in front, with large lateral lobes. Abdominal epimera lamellarly expanded .... 76. *Actoniscus.*
  b′. Head rounded in front, not lobated at the sides. Abdominal epimera but little developed .... 77. *Scyphacella.*

75. TRICHONISCUS Brandt.

179. TRICHONISCUS PUSILLUS Brandt.

Trichoniscus pusillus BRANDT, Conspectus Monogr. Crust. Oniscodorum, p. 12, pl. IV, fig. 9.
Itea riparia KOCH, Deutschl. Crust., p. 22.
Itea lævis ZADDACH, Synops. Crust. Pruss., p. 16.
Philougria riparia KINAHAN, Nat. Hist. Rev., IV, p. 281, pl. XXII, figs. 1–4.
Trichoniscus pusillus G. O. SARS, Crust. of Norway, II, Pts. 9 and 10, 1897, p. 161.

Habitat.—North America; also Sweden; Denmark; Germany; France; Great Britain; Spain; Algeria; coast of Norway.

76. ACTONISCUS Harger.

180. ACTONISCUS ELLIPTICUS Harger.

Actoniscus ellipticus HARGER, Am. Jour. Sci., XV, 1878, p. 373; Proc. U. S. Nat. Museum, II, 1879, p. 159; Rep. U. S. Fish Comm., 1880, Pt. 6, p. 309–310, pl. I, fig. 3.

Armadilloniscus ellipticus BUDDE-LUND, Crust. Isop. Terrestria, 1885, p. 239.

Habitat.—Savin Rock, near New Haven, Connecticut; Stony Creek, Long Island Sound.

Depth.—Found on beach.

On Sars's authority I have retained this genus with the *Trichoniscidæ*, where he placed it.

77. SCYPHACELLA Smith.

181. SCYPHACELLA ARENICOLA Smith.

Scyphacella arenicola SMITH, Rep. U. S. Fish Comm., Pt. 1, 1874, p. 568 (274).—VERRILL, Rep. U. S. Fish Comm., Pt. 1, 1874, p. 337 (43).—HARGER, Proc. U. S. Nat. Museum, II, 1879, p. 157; Rep. U. S. Fish Comm., 1880, Pt. 6, p. 307–308, pl. I, fig. 2. (See Harger for synonymy.)

Trichoniscus arenicola BUDDE-LUND, Crust. Isop. Terrestria, 1885, p. 249.

Habitat.—Egg Harbor, New Jersey; Nobska Beach, Vineyard Sound; Nantucket Island.

Depth.—Found on beach.

Sars places *Scyphacella* with the *Trichoniscidæ*, where, following his authority, I have retained it.

VI. EPICARIDEA or BOPYROIDEA.

ANALYTICAL KEY TO THE FAMILIES OF EPICARIDEA.

a. Body of female distinctly segmented, more or less asymmetrical, twisted either to right or left. Maxillipeds lamellar, biarticulate, and more frequently exhibiting a small terminal joint. Legs in seven pairs, sometimes obsolete on one side. Incubatory plates five pairs, more or less arching over the ventral surface of the thorax. Pleopoda forming simple or double lamellæ, all of the same structure, rarely obsolete. Male with all the segments of the thorax sharply defined. Last larval stage with the flagellum of the antennæ four articulate; legs of uniform structure; uropoda with inner branch shorter than outer. Parasitic on decapodous crustacea. Family XXIII. BOPYRIDÆ (p.577).

a'. Body of female perfectly symmetrical, the segmentation, as a rule, only visible in the middle of the dorsal face. Maxillipeds lamellar, without any terminal joint. Only five pairs of legs present. Incubatory plates comparatively small, sometimes greatly reduced in number, and scarcely at all partaking of the formation of the marsupium, which constitutes two separate cavities bounded by the lateral walls of the body itself. Pleopoda generally rudimentary or wholly absent. Male with head and first segment of thorax coalesced. Last larval stage with the flagellum of the antennæ five articulate; legs of the first pair shorter and thicker than the others; uropoda with the branches subequal. Parasitic on *Schizopoda*............ Family XXIV. DAJIDÆ (p. 579).

Family XXIII. BOPYRIDÆ.

ANALYTICAL KEY TO THE GENERA OF BOPYRIDÆ.

a. Body of female with one side greatly swollen and much longer than other. Segments of thorax only visible dorsally, coxal plates only present on shorter side. Abdomen consisting of five segments. Only first leg present on larger side; others wholly obliterated. Four pairs of pleopoda present. Male with abdominal segments fused .... 78. *Phryxus*.
a′. Body of female with neither side swollen. Thorax distinctly segmented. Abdomen consisting of six segments. All the legs present on both sides.
  b. Uropoda wanting.
    c. Pleopoda in female simple, lamellar .... 79. *Bopyrus*.
    c′. Pleopoda in female obsolete, replaced by fleshy ridges...... 80. *Bopyroides*.
  b′. Uropoda distinct. Pleopoda in female present. Legs of female with an adhesive process (exopod) attached to the coxal joint of all the legs. Feet end in blunt claw. Abdominal appendages form sharp, finely fringed branches. 81. *Leidya*.

78. PHRYXUS Rathke.

182. PHRYXUS ABDOMINALIS (Krøyer).

Bopyrus abdominalis KRØYER, Nat. Tidsskrift, II, 1840, pp. 102–289, pls. I, II; Monog. Fremst. Slægten Hippolytes nordiske Arter, 1842, p. 263; Voy. en Scand., Crust., 1849, pl. XXIX, fig. 1.

Phryxus hippolytes RATHKE, Fauna Norwegens, 1843, p. 40, pl. II, figs. 1–10.

Phryxus abdominalis LILLJEBORG, Oefvers. Kongl. Vet. Akad. Forh., IX, 1852, p. 11.—STEENSTRUP and LÜTKEN, Vidensk. Meddelelser, 1861, p. 275 (9).—BATE and WESTWOOD, Brit. Sessile-eyed Crust., II, 1868, p. 234.—NORMAN, Rep. Brit. Assoc., 1869, p. 288; Proc. Royal Soc. Lon., XXV, 1876, p. 209.—BUCHHOLZ, Zweite deutsche Nordpolfahrt, 1874, p. 287.—METZGER, Nordseefahrt der Pomm., 1875, p. 286.—MIERS, Ann. Mag. Nat. Hist. (4), XX, 1877, p. 65 (15).—SMITH in Harger, Proc. U. S. Nat. Museum, II, 1879, p. 158.—HARGER, Rep. U. S. Fish Com., 1880, Pt. 6. (See Harger for synonymy).—AXEL OHLIN, Bidrag till Kannedomen om Malakostrakfaunan i Baffin Bay och Smith Sound, 1895, p. 18–19.

Habitat.—Massachusetts Bay on *Pandalus borealis*, *Spirontocaris spinus*, *S. securifrons* and *Pandalus montagui;* Cashes Ledge, Gulf of Maine, on *Pandalus borealis* and *S. pusiola;* Georges Bank on *Pandalus leptocerus;* Halifax, Nova Scotia, on *S. pusiola*, *S. spinus* and *S. securifrons;* Cape Cod on *S. polaris;* Grinnell Land; Discovery Bay; Greenland; Cape Dudley Digges on *S. turgida* and *S. polaris;* Inglefield Gulf on *S. polaris;* 73° 48′ N. lat., 80° 30′ W. long, on *S. polaris;* 64° 56′ N. lat., 66° 18′ W. long., on *S. turgida;* also, British Isles; Scandinavian Coast; Spitzbergen; Kara Sea; Coast of Norway.

Depth.—5 to 25 furlongs.

79. BOPYRUS Latreille.

ANALYTICAL KEY TO THE SPECIES OF BOPYRUS.

a. Head posteriorly narrowed, triangular in shape. Antero-lateral angles not produced into lobes. Abdominal segments with lateral margins contiguous. Color whitish, feet and incubatory lamellæ pigmented with black. Male with eyes .... 183. *Bopyrus palæmoneticola* Packard.

a′. Head posteriorly widened, rounded in shape. Antero-lateral angles produced into lobes. Abdominal segments with lateral margins not contiguous but separated by broad lateral incisions. Color white, feet and incubatory lamellæ not pigmented, Male without eyes......... 184. *Bopyrus alphei* Richardson.

183. BOPYRUS PALÆMONETICOLA Packard.

Bopyrus palæmoneticola PACKARD, Zool. for High Schools and Colleges, 1881.—GISSLER, Am. Nat., XVI, pp. 6–12.

Bopyrus (?) LEIDY, Proc. Ac. Nat. Sci. Phila., 1879, Pt. 2, p. 198.—HARGER, Report U. S. Fish Comm., 1880, Pt. 6, p. 312.

Habitat.—Atlantic City, New Jersey, on *Palæmonetes vulgaris* (Say).

184. BOPYRUS ALPHEI Richardson.

Gyge sp.? H. V. WILSON, American Naturalist, XXXIV, 1900, p. 353.

Bopyrus alphei RICHARDSON, Proc. Wash. Acad. Sci., II, 1900, pp. 158, 159.

Habitat.—Beaufort, North Carolina, on *Alpheus heterochælis;* Mangroves, Rio Parahyba do Norte, Brazil, on *Alpheus heterochælis.*

80. BOPYROIDES Stimpson.

ANALYTICAL KEY TO THE SPECIES OF BOPYROIDES.

a. Lateral margins of thoracic segments, straight, contiguous, without any marginal indentation. Abdominal epimera truncate at tip. Terminal segment likewise truncate................................ 185. *Bopyroides hippolytes* (Krøyer).

a′. Lateral margins of thoracic segments rounded with marginal indentation. Abdominal epimera rounded. Terminal segment likewise rounded. 186. *Bopyroides latreuticola* Gissler.

185. BOPYROIDES HIPPOLYTES (Krøyer).

Bopyrus hippolytes KRØYER, Grønlands Amfipoder, 1838, p. 306 (78), pl. IV, fig. 22; Monog. Fremst. Slægten Hippolytes Nordiske Arter, 1842, p. 262.—Voy. en Scand., Crust., 1849, pl. XXVIII, fig. 2.—EDWARDS, Hist. Nat. des Crust., III, 1840, p. 283.—STIMPSON, Proc. Acad. Nat. Sci. Phila., 1863, p. 140.

Gyge hippolytes BATE and WESTWOOD, Brit. Sess. Crust., II, 1868, p. 230.—BUCHHOLZ, Zweite Deutsche Nordpolfahrt, 1874, p. 286.—METZGER, Nordseefahrt der Pomm., 1875, p. 286.—MIERS, Ann. Mag. Nat. Hist., (4), XX, 1877, p. 64 (14).—SMITH in Harger, Proc. U. S. Nat. Museum, II, 1879, p. 157.—HARGER, Rep. U. S. Fish Comm., 1880, Pt. 6.—AXEL OHLIN, Bidrag till Kannedomen om Malakostrakfaunan i Baffin Bay och Smith Sound, 1895, p. 19.

Bopyroides hippolytes G. O. SARS, Crust. of Norway, II, Pts. 11, 12, 1897, pp. 199, 200, pl. LXXXIV, fig. 2.

Habitat.—Massachusetts, Bay of Salem, on *Spirontocaris spinus*, *S. fabricii* and *S. securifrons;* Casco Bay on *S. polaris* and *S. pusiola;* Bay of Fundy, on *S. spinus* and *S. pusiola;* Halifax, Nova Scotia; Gulf of Maine on *S. securifrons* and *S. spinus*; 73° 48′ N. lat., 80° 30′ W. long., on *S. polaris;* 72° 33′ N. lat., 71° 30′ W. long., on *S. polaris;* 71° 42′ N. lat., 73° W. long., on *S. polaris;* 66° 33′ N. lat., 61° 50′ W. long., on *S. polaris;* 64° 56′ N. lat., 66° 18′ W. long., on *S. polaris.*

Depth.—5 to 15 fathoms.

186. BOPYROIDES LATREUTICOLA Gissler.

Bopyroides latreuticola Gissler, Am. Nat., XVI, 1882, pp. 591–594.
Bopyrus latreutis Spence Bate, *Challenger* Report, XXIV, 1888, p. 584.

Habitat.—Beaufort, North Carolina, on *Latreutes ensiferus* (Milne-Edwards) lat. 28° 17′ 07″ N., long. 66° 17′ 37″ W.; lat. 31° 15′ 42″ N., long. 67° 39′ 10″ W., on *Latreutes ensiferus* (Milne-Edwards); Bermuda.

81. LEIDYA Cornalia and Panceri.

187. LEIDYA DISTORTA (Leidy).

Cepon distortus Leidy, Journ. Acad. Nat. Sci. Phila. (2), III, 1855, p. 150, pl. xi, figs. 26–32.—Harger, Rep. U. S. Fish Comm., Pt. 1, 1874, p. 573 (279), Proc. U. S. Nat. Museum, II, 1879, p. 157.
Leidya distorta Cornalia and Panceri, Mem. R. Acad. Sci., Torino, II, XIX, 1861, p. 114.
Cepon distortus Harger, Rep. U. S. Fish Comm., 1880, Pt. 6.—Richardson, Am. Nat., XXXIV, 1900, p. 309.

Habitat.—Atlantic City, New Jersey, in branchial cavity of *Uca pugilator*.

Family XXIV. DAJIDÆ.

82. DAJUS Krøyer.

188. DAJUS MYSIDIS Krøyer.

Dajus mysidis Krøyer, Voy. en Scand., Crust., 1849, pl. xxviii, fig. 1.—Lütken, Crustacea of Greenland, 1875, p. 150.—G. O. Sars, Arch., Math. Nat., II, 1877, p. 354 [254].—Smith in Harger, Proc. U. S. Nat. Museum, II, 1879, p. 158.
Bopyrus mysidium Packard, Mem. Bos. Soc. Nat. Hist., I, 1867, p. 295, pl. viii, fig 3.
Leptophryxus mysidis Buchholz, Zweite Deutsche Nordpolfahrt, 1874, p. 288, pl. ii, fig. 2.
Dajus mysidis Harger, Rep. U. S. Fish Comm., 1880, Pt. 6, p. 312,

Habitat.—Labrador; Greenland; Kingigtok; Duck Island; Murchison Sound; 73° 48′ N. lat., 80° 30′ W. long.; 72° 33′ N. lat., 71° 30′ W. long.; 71° 57′ N. lat., 73° 56′ W. long.; 66° 33′ N. lat., 61° 50′ W. long.; 64° 56′ N. lat., 66° 18′ W. long.; West Coast of Norway; Kara Sea; Sabine Island; Spitzberg; Jan Mayen; Murman coast.

Depth.—3 to 20 fathoms.

SOME SPIDERS AND OTHER ARACHNIDA FROM SOUTHERN ARIZONA.

By Nathan Banks,
Custodian, Section of Arachnida.

Hardly anything is known regarding the spiders of Arizona. Count Keyserling described a few species from the Marx collection, and in recent years Simon has described several curious forms collected, doubtless, by Morrison. Dr. McCook, in his American Spiders, records a few species of Epeiridæ from this region. Arizona is especially interesting for two reasons: first, because of its proximity to Mexico, and second, because the isolated mountainous regions give rise to many local faunas.

In the collection made by Mr. E. A. Schwarz there are 55 species—43 spiders and 12 other arachnids. Eight species are described as new. Five species, namely, *Sparassus minax*, *Misumena pallida*, *Misumena fidelis*, *Oxyopeidon molestum*, and *Ammotrecha peninsulana*, have not previously been recorded north of the Mexican boundary. About twenty of the spiders are of rather general distribution in the United States, at least in the southern portions. Most of the others are more or less restricted in their range, and about thirteen of the spiders are known only from Arizona. Only one species, *Philodromus aureolus*, also occurs in Europe.

ARANEIDA.

Family THERAPHOSIDÆ.

EURYPELMA HENTZI (Girard).

Male and female from Oracle, in July. Young, apparently of this species, from Santa Rita Mountains, May.

Family SCYTODIDÆ.

PLECTREURYS TRISTIS Simon.

One from Catalina Springs, April. A rather rare spider.

Family PHOLCIDÆ.

PHYSOCYLUS GIBBOSUS (Taczanowski).

An immature specimen, probably of this species, from Catalina Springs, April.

Family DRASSIDÆ.

PROSTHESIMA ATRA (Hentz).

One male from Catalina Springs, April.

PROSTHESIMA ARIZONENSIS, new species.

Length of female, 7 mm.

Cephalothorax yellowish brown, black around eyes; mandibles rather darker than cephalothorax; legs yellowish brown, rather darker on tips; sternum more reddish brown, black on margin; abdomen dull black above and below, spinnerets pale yellowish. Cephalothorax considerably narrowed in front, quite flat, dorsal groove distinct. Posterior eye-row slightly procurved; posterior median eyes oval, less than their diameter apart, about as close to the equal posterior side eyes; anterior eye-row nearly straight; anterior median eyes fully diameter apart, nearly touching the equal anterior side eyes, about as large as posterior median eyes; quadrangle of median eyes much higher than broad, and as broad in front as behind. Legs of moderate length, tibia I with one pair of spines at tip beneath, metatarsus I with three pairs below, one of which is at the tip; metatarsus not scopulate; many spines on hind legs. Sternum nearly oval, broadest behind coxæ II. Abdomen depressed, truncate at base, nearly one and three-fourths as long as broad, broadest behind middle; epigynum shows a narrow transverse cavity open behind into a short, widening cavity.

One female from Catalina Springs, April.

Type.—Cat. No. 5424, U.S.N.M.

PROSTHESIMA SCHWARZI, new species.

Length of female, 12 mm.

Cephalothorax yellowish brown, black around eyes; mandibles yellow-brown; sternum more red-brown; legs yellow-brown, anterior metatarsi and tarsi much darker; abdomen pale yellowish gray above and beneath, black hairs at base, spinnerets more yellow. Cephalothorax rather broad in front. Posterior eye-row plainly procurved, not broader than anterior eye-row, eyes widely separate; the posterior median eyes oval, more than their diameter apart, more than twice their diameter from the smaller posterior side eyes; anterior eye-row little procurved, anterior median eyes larger than posterior median eyes, about diameter apart, much closer to the nearly equal anterior side eyes, quadrangle of median eyes about one and one-half as high as broad. Anterior legs quite stout, hind pairs much more slender; metatarsi and tarsi I and II with scopulas; tibia I with one spine below near base, one near middle, and a pair at tip; metatarsus I with one pair near base. Abdomen rather thick, truncate at base, more than one and one-half times as long as broad; epigynum shows a large, oblong corneus area, in the hind part of which is an elliptical cavity, nearly filled by a plate from in front.

One female, Catalina Springs, April.

Type.—Cat. No. 5425, U.S.N.M.

Family CLUBIONIDÆ.

CHEMMIS UNICOLOR, new species.

Length of female, 14 mm.

Cephalothorax reddish brown, rather darker in front; mandibles dark red-brown; sternum yellow-brown, dark on sides; legs yellowish brown on base, darker and more red-brown beyond; abdomen pale brown above and below, darkest near tip. Cephalothorax rather broad in front, moderately elevated; mandibles large and stout. Posterior eye-row longer than anterior eye-row, slightly procurved; posterior median eyes round, a little more than diameter apart, nearly twice diameter from slightly smaller posterior side eyes; anterior eye-row nearly straight, anterior median eyes hardly as large as posterior median eyes, scarcely diameter apart, about diameter from scarcely larger anterior side eyes; quadrangle of median eyes rather higher than broad, broader behind than in front. Three teeth on hind margin of fang-groove. Legs rather stout, but long, IV a little longer than I, and more slender. Five pairs of spines under tibia I, metatarsus I with 3 pairs, in each case the apical pair is short. All tarsi, metatarsi I and II, and apex of III and IV, are scopulate. Two spines above on tibia III. Lip half the length of maxillæ, hollow truncate at tip. In front of spinnerets is a curious truncate lip.

One female from Santa Rita Mountains, June.

Type.—Cat. No. 5426, U.S.N.M.

Differs from the one species of the genus in having anterior median eyes not larger than anterior side eyes, but otherwise agrees very well in structure.

TRACHELAS TRANQUILLA (Hentz).

Several specimens from Catalina Springs, April, May; and Santa Rita Mountains, May, June.

ANYPHÆNA, species.

Immature specimens from Santa Rita Mountains, June.

THARGALIA LUCTUOSA, new species.

Length of female, 7.8 mm.; cephalothorax, 3.5 mm.; tibia + patella I, 3.4 mm.

Cephalothorax pale reddish brown, rather darker on the sides, clothed in the middle with yellowish-white hairs; abdomen black above, with white marks—a somewhat triangular mark in front, connected behind to a broad band; behind this are two white spots, and beyond at near middle of length are two transverse white patches; behind these are two small white dots, and near tip a white band, extreme tip black; the sides show two broad oblique bars, both near base; venter brown; sternum pale red-brown; legs pale reddish brown, yellowish on anterior pairs beyond patellæ, femur III pale at base, brown beyond and on part of patella and tibia, and most of metatarsus; femur IV pale at base, dark brown beyond, patella and tibia black, the latter with prominent basal and apical white bands, metatarsus black. Cephalothorax rather slender, narrow in front; eyes close together, anterior row straight, subequal, and at equal distances, posterior row procurved, posterior median eyes farther from each other than from the equal posterior side eyes; sternum truncate in front, rounded on sides, pointed behind. Two pairs of spines under tibia I, two pairs under metatarsus I, three pairs under tibia IV, and one above near tip. Entire dorsum of abdomen rather tough, but no distinct shield. The epigynum shows two approximated elliptical cavities; in the anterior part of each is a deeper cavity.

One female from Santa Rita Mountains, May.

Type.—Cat. No. 5427, U.S.N.M.

Family THERIDIIDÆ.

LATHRODECTUS MACTANS (Fabricius).

One female from Oracle, July.

LITHYPHANTES, species.

One female from Oracle, July, near to *L. fulvus*, but apparently distinct; at least a color variety.

DIPŒNA PARVULA, new species.

Length of female, 2.2 mm.

Cephalothorax, legs, mandibles, and sternum dark yellowish brown, black in eye region; abdomen black. Cephalothorax high, projecting in front, clypeus concave. Posterior eye row nearly straight; posterior median eyes less than diameter apart, more than diameter from slightly smaller posterior side eyes; anterior eye row (seen from above) recurved; the anterior side eyes touching posterior side eyes, and of equal size; the anterior median eyes larger than other eyes, and placed on the front of the head at highest point, about their diameter apart, and much closer to the smaller anterior side eyes; quadrangle of median eyes much broader in front than behind, and a little higher than broad behind. Palpi heavy. Legs rather short and stout. Abdomen large, from above as broad in front as behind, and equally rounded each end, about once and one-fourth as long as broad, quite high, and projecting behind over the spinnerets. The region of epigynum is rather prominent, and from behind shows a simple opening.

One specimen from Catalina Springs, April.

Type.—Cat. No. 5428, U.S.N.M.

Family EPEIRIDÆ.

EPEIRA GEMMA McCook.

Santa Rita Mountains, May (young); Fort Grant, July [Hubbard].

EPEIRA PROMPTA Hentz.

Catalina Springs, May, April; Oracle, July. They are of the form described by McCook as *E. conchlea.*

EPEIRA LABYRINTHEA Hentz.

Catalina Springs, May.

EPEIRA ARIZONENSIS Banks.

A male and young specimens from Madera Canyon, Santa Rita Mountains, June.

LARINIA DIRECTA (Hentz).

Catalina Springs, April.

TETRAGNATHA GRALLATOR Hentz.

A young male from Santa Rita Mountains.

Family SPARASSIDÆ.

SPARASSUS MINAX Cambridge.

A male from Santa Rita Mountains, May, appears to belong to this Mexican species, previously unknown in our country.

OLIOS FASCICULATUS Simon.

Sadala simoni CAMBRIDGE.
Olios giganteus KEYSERLING.

Several specimens from Catalina Springs, May (young); Madera Canyon, Santa Rita Mountains, June; and Oracle, July. I suspect that this is the same as the *Ocypete testacea* of Koch,[1] in which case Koch's name will have priority.

SELENOPS, species.

A young specimen from Madera Canyon, Santa Rita Mountains, possibly belonging to *S. nigromaculatus* Keyserling.

Family THOMISIDÆ.

MISUMENA PALLIDA Cambridge.

A few females from Santa Rita Mountains, June, and Oracle, July, probably belong to this species.

MISUMENA FIDELIS Banks.

A female from Catalina Springs, April, appears to belong here.

CORIARACHNE VERSICOLOR Keyserling.

Females from Catalina Springs, May, and Madera Canyon, Santa Rita Mountains, June.

PHILODROMUS MARGINELLUS, new species.

Length of female, 15 mm.

Cephalothorax pale dirty whitish, a purer white V-mark and a median anterior line, sides evenly and quite broadly margined with brown. Abdomen dirty white above, brown on the anterior sides, and on the posterior sides darker brown, sharply marked off from the pale above; on posterior median portion of dorsum is a double series of dark marks, converging toward tip. Legs pale, darker at tips of femora and on bases of anterior tibiæ, elsewhere with a few scattered brown dots. Sternum and venter white, the latter margined each side with brown. Cephalothorax about as broad as long, a little shorter than femur I; posterior median eyes slightly larger and farther apart than anterior median eyes. Abdomen large, pointed behind; the epigynum shows a subtriangular cavity, traversed by a median septum, broader behind than in front.

A female, Santa Rita Mountains, June.

Type.—Cat. No. 5429, U.S.N.M.

PHILODROMUS AUREOLUS Walckenaer.

One specimen from Oracle, July.

PHILODROMUS, species.

One female from Catalina Springs, May, of uncertain position, quite large, pale, and dorsum marked with brown.

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[1] Die Arach., IV, 1838, p. 81, fig. 303.

TMARUS CAUDATUS (Hentz).

Young specimens from Santa Rita Mountains and Catalina Springs.

Family LYCOSIDÆ.

LYCOSA SCALARIS (Thorell).

One male from Santa Rita Mountains, May.

LYCOSA SCUTULATA Hentz.

A young specimen from Santa Rita Mountains.

Family OXYOPIDÆ.

PEUCETIA VIRIDANS (Hentz).

Several specimens from Catalina Springs, May; Madera Canyon, Santa Rita Mountains, June.

OXYOPEIDON MOLESTUM Cambridge.

Several immature specimens from Catalina Springs, Santa Rita Mountains, and Oracle appear to agree with this species.

Family ATTIDÆ.

PHIDIPPUS MEXICANUS Peckham.

A few specimens from Santa Rita Mountains, June (young); and Oracle, July.

PHIDIPPUS, species.

An immature specimen from the Santa Rita Mountains, in June. The abdomen is dark, with a yellowish band at base, near middle a transverse row of four white dots, toward tip an oblong white mark each side, and a white dot each side just above the spinnerets.

DENDRYPHANTES RETARIUS (Hentz).

Specimens from Madera Canyon, Santa Rita Mountains, all in June.

DENDRYPHANTES NUBILUS (Hentz).

A female from Santa Rita Mountains, June.

DENDRYPHANTES, species.

An immature male of an apparently undescribed species from Santa Rita Mountains, May.

HABROCESTUM, species.

A female from Oracle, July. Cephalothorox dark; anterior legs dark, posterior pairs paler, not plainly marked; venter pale; abdomen above dark, with white marks on the posterior sides in the usual manner. Can not be named without male.

HABROCESTUM, species.

One female from Santa Rita Mountains, June. Smaller than the preceding; cephalothorax brown; legs pale, with small brown blotches; venter pale; dorsum pale, with a large black mark containing a central pale spot. Almost certainly new, but better not described from this sex.

ASTIA MOROSA Peckham.

A female from Santa Rita Mountains, May.

MARPTUSA CALIFORNICA Peckham.

One from Catalina Springs, April.

CYRBA TÆNIOLA (Hentz).

Two specimens from Catalina Springs, May, and Santa Rita Mountains, June.

SYNAGELES SCORPIONA (Hentz).

One specimen from Catalina Springs.

PHALANGIDA.

LIOBUNUM TOWNSENDI Weed.

One specimen from Madera Canyon, Santa Rita Mountains, May.

TRACHYRHINUS FAVOSUS (Wood).

One specimen from Madera Canyon, Santa Rita Mountains, May.

SCORPIONIDA.

VEJOVIS SPINIGERUS Wood.

Three specimens from Madera Canyon, Santa Rita Mountains, June.

CENTRURUS CAROLINIANUS (Beauvois).

Two specimens from Oracle, July, seem to belong to this species, but are very pale in color.

PSEUDOSCORPIONIDA.

IDEOBISUM THREVENETI (Simon).

One specimen from Madera Canyon, Santa Rita Mountains, May.

CHELIFER HUBBARDI, new species.

Length, 3 mm.

Dark red-brown, palpi brighter red-brown, legs rather yellow-brown. Cephalothorax of usual shape, surface finely granulate, and with many large, sharp, rough tubercles; a distinct eye-spot each side. Palpi long, slender; femur much longer than the cephalothorax plus mandibles, gradually thickened to tip, but nearly straight on each side; tibia plainly shorter than femur, but rather longer than the cephalothorax, at tip rather larger than tip of femur, inner margin straight, outer slightly convex; claw about as long as femur; hand nearly twice as wide as tibia, broadly rounded at base, tapering each side to fingers, which are about equal in length to the hand, and but slightly curved. Hairs on palpi are simple, but some on basal joints are thick and nearly clavate. Abdominal scutæ each with a roughened ridge, most prominent in the males.

Several specimens from Catalina Springs, Madera Canyon, and Oracle; in decaying *Cereus* and *Dasylirion.*

Type.—Cat. No. 5430, U.S.N.M.

CHELANOPS ARIZONENSIS, new species.

Length, 3 mm.

Cephalothorax very dark brown, abdominal scutæ brown, palpi clear red-brown, legs paler. Cephalothorax nearly smooth, with distinct furrows, and two faint eye-spots. Palpi large; trochanters globose behind; femur shorter than width of cephalothorax in middle, about two and one-half times as long as broad at base, slightly concave on inner margin near tip; tibia fully as long as femur, evenly convex on outer edge, strongly convex on middle of inner margin, in middle broader than femur; hand subtruncate at base, rounded each side and tapering slightly to the fingers, about one-fourth longer than broad; fingers as long as hand, stout, and slightly curved. Femur and tibia with short stout hairs, those on inner margin nearly clavate.

A few specimens from Catalina Springs, Santa Rita Mountains, and Oracle; in decaying *Cereus* and *Dasylirion.* In company with *Chelifer hubbardi.*

Type.—Cat. No. 5431, U.S.N.M.

SOLPUGIDA.

EREMOBATES CINEREA (Putnam).

Two males: Oracle, July; Madera Canyon, Santa Rita Mountains, June. Both attracted to lights.

AMMOTRECHA PENINSULANA (Banks).

Several specimens from Madera Canyon, Santa Rita Mountains, April. Not previously known north of Mexico.

ACARINA.

ARGAS SANCHEZI Dugès.

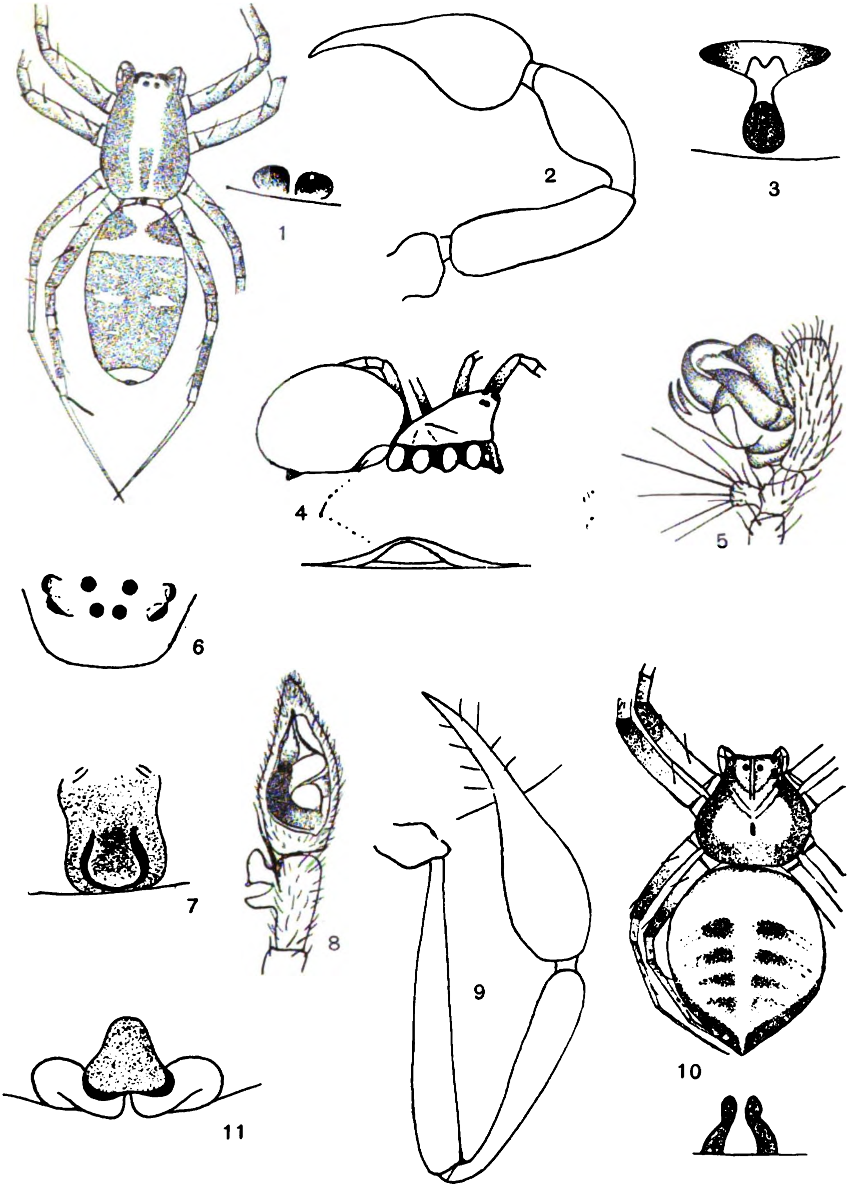
Catalina Springs, April; also Deming, New Mexico, July. Known as the "adobe tick."

IXODES, species.

Catalina Springs, April. On house bat; not adult, and therefore can not be identified with certainty.

EXPLANATION OF PLATE XXII.

FIG. 1. *Thargalia luctuosa*, spider and vulva.
2. *Chelanops arizonensis*, palpus.
3. *Prosthesima arizonensis*, vulva.
4. *Dipœna parvula*, spider and vulva.
5. *Epeira arizonensis*, male palpus.
6. *Plectreurys tristis*, eyes.
7. *Prosthesima schwarzi*, vulva.
8. *Sparassus minax*, male palpus.
9. *Chelifer hubbardi*, palpus.
10. *Philodromus marginellus*, spider and vulva.
11. *Chemmis unicolor*, vulva.



SOME ARIZONA SPIDERS.

FOR EXPLANATION OF PLATE SEE PAGE 590.

A NEW DINOSAUR, STEGOSAURUS MARSHI, FROM THE LOWER CRETACEOUS OF SOUTH DAKOTA.

By Frederic A. Lucas,
Curator, Division of Comparative Anatomy, in charge of Section of Vertebrate Fossils.

The name *Stegosaurus marshi* is proposed for a new species of Stegosaur represented by a number of plates, spines, and portions of the nuchal and gular armature, as well as by some vertebræ and bones of the limbs, obtained by Mr. N. H. Darton in South Dakota from beds considered by him to be of Lower Cretaceous age.

This material, which is in the U. S. National Museum and is the type of the species, is numbered 4752 in the catalogue of fossil vertebrates. It was found associated with remains of another dinosaur of moderate size, probably related to Camptosaurus. The species is characterized by the general massive appearance of the plates and spines, the comparatively large extent of their basal surfaces, their abrupt taper and sharp edges. In these respects they are quite different from the corresponding portions of any other Stegosaur yet discovered, and coming as they do from the highest horizon in which remains of Stegosaurs have been found they may be considered as representing the latest developments in the dermal armature of this remarkable group of dinosaurs.

A dermal spine, found by Mr. J. B. Hatcher, in conjunction with remains of Triceratops, and regarded at the time as belonging to that genus, may very likely have come from the species under consideration.

A spine, shown on Plate XXIII, presumably from near the posterior end of the caudal series, has a long and comparatively wide basal portion and then tapers rapidly to a spike-like form.

A plate, shown on Plate XXIV, apparently from the caudal series, somewhat in advance of the spine just described, is triangular in section, slightly rounded on one surface, while on the other it tapers abruptly from the base with a concave curve.

Another plate, probably from the dorsal series, is much more compressed than either of the two already noted, and seen in profile has the form of a rather narrow, high triangle.

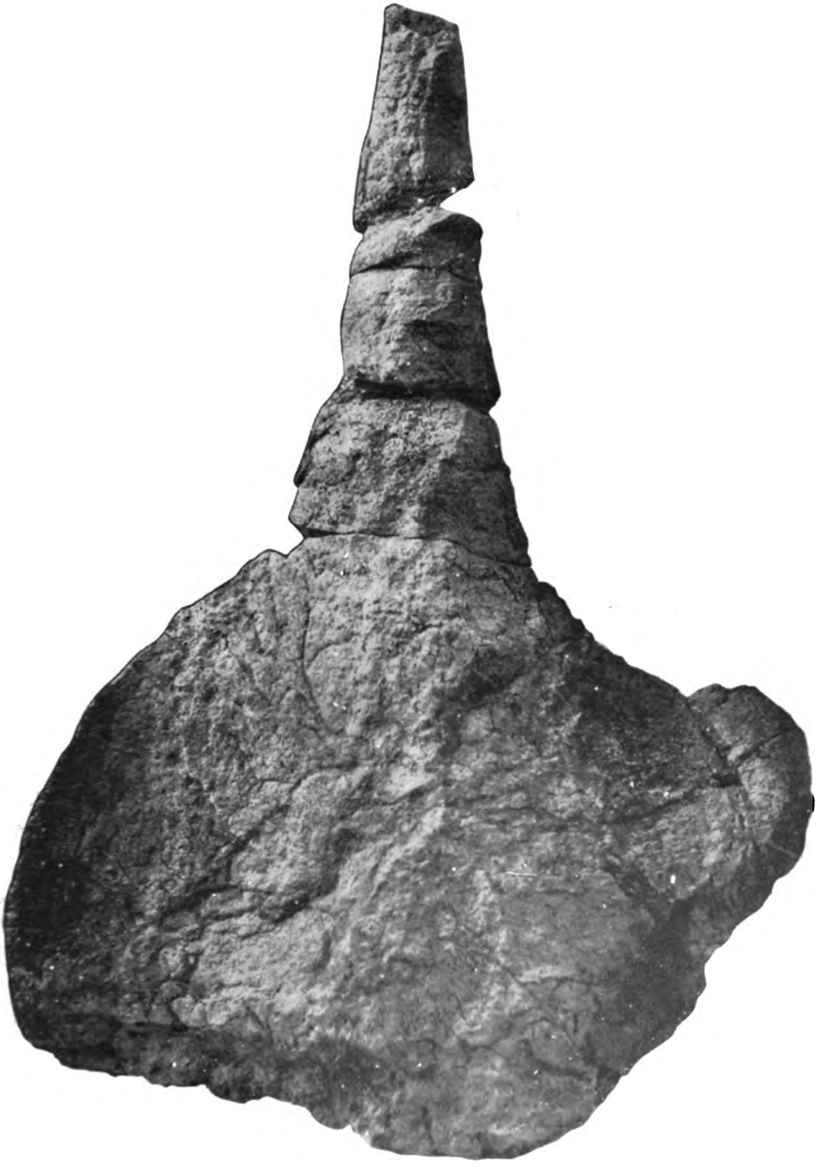
None of the large, thin, flattened plates, so characteristic of Stegosaurs hitherto described, are present, and while the material available is too scanty to warrant any positive assertion regarding them, yet it seems probable that in the species under consideration all the plates were small and heavy.

The nuchal armor consists of small, thick, irregularly quadrilateral plates, slightly keeled, and these, save for their smoothness, are suggestive of the nuchal and dorsal plates of crocodiles.

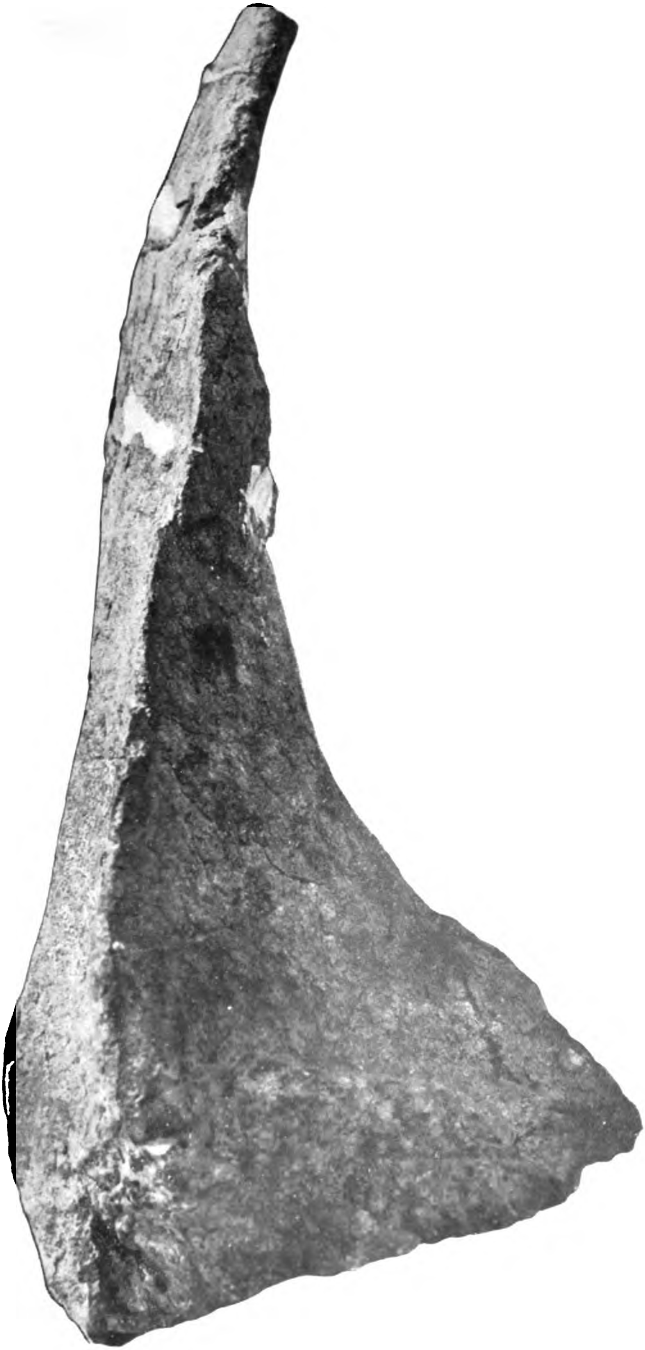
The throat was protected by rounded ossicles varying from 3 to 25 mm. in diameter, and many of these are present on the slab containing the nuchal plates. It is entirely probable that this species represents a distinct genus of Stegosaurs; but in the absence of material on which to base a generic diagnosis it seems best not to bestow upon it a new generic name.

This specimen was recognized by the late Prof. O. C. Marsh as representing a new form and, as it was almost the last specimen to be studied by him, it seems particularly appropriate to name the species in honor of one who did so much to make the Stegosaurs known.

The following are the measurements of the spine and plates described: Caudal spine, shown on Plate XXIII, 370 mm. high and 252 in antero-posterior diameter; caudal plate, shown on Plate XXIV, 304 mm. high and 155 in antero-posterior diameter; width of articular face 148 mm.; dorsal plate 380 mm. in greatest height, and 198 in antero-posterior diameter.



CAUDAL SPINE OF STEGOSAURUS MARSHI.



CAUDAL PLATE OF STEGOSAURUS MARSHI.

NEW DIPTERA IN THE U. S. NATIONAL MUSEUM.

By D. W. Coquillett,

Custodian, Section of Diptera.

In the course of identifying the New Jersey diptera for Dr. J. B. Smith's excellent list of the insects of that State, Mr. C. W. Johnson, curator of the Wagner Free Institute, of Philadelphia, encountered quite a series of specimens belonging to obscure groups which he was unable to identify within the limited time allowed him for this purpose, and consequently submitted them to the writer for study. Mr. Johnson permitted the retention for the U. S. National Museum collection of specimens pertaining to species not already represented therein, the only conditions being that the data from the labels be sent him, together with the names of the known forms and manuscript names of such as were believed to be new to science. As these manuscript names have now been published it is deemed advisable to publish descriptions of these species and thus render permanent the names which would otherwise have no value. Accordingly, these descriptions are offered herewith, together with a number of those of other forms encountered when identifying specimens for correspondents, or while studying and comparing the Museum collection. These make a total of 2 genera and 71 species.

Family MYCETOPHILIDÆ.

BOLITOPHILA MONTANA, new species.

Dark brown, the base of the third antennal joint, peduncle of the halteres, coxæ, femora and tibiæ light yellow, sides of mesonotum largely brownish yellow, mesonotum polished; wings hyaline, stigma elongate oval, gray; auxiliary vein reaches only slightly beyond middle, between humeral cross vein and base of third vein, anterior branch of third vein terminates in the costa, fourth vein at its base coalescing for a short distance with the upper branch of the fifth near its base; length, 4.5 mm. A female specimen, collected by Mrs. A. T. Slosson.

Habitat.—Mount Washington, New Hampshire.

Type.—Cat. No. 5438, U.S.N.M.

MACROCERA NEBULOSA, new species.

Yellow, the antennæ except the base, three large spots on the pleura, knobs of halteres, bases of abdominal segments two to five and whole of abdomen beyond the fifth segment in the male, the base of each segment except the first in the female, also the tarsi, dark brown; body polished; wings bare, hyaline, marked with four irregular brown fasciæ; the first begins at apex of auxiliary vein and extends to the anal angle; the second extends from apex of first vein to apex of the sixth, and is almost, or quite, interrupted in the fourth posterior cell; the third extends from anterior branch of third vein to apex of anterior branch of the fifth, while the last one borders apex of wing and is connected with the preceding one along the third vein and both branches of the fourth; length, 4 to 5 mm. Two males and one female.

Habitat.—Mount Washington and Franconia, New Hampshire (Mrs. A. T. Slosson), and Clementon, New Jersey (Mr. C. W. Johnson).

Type.—Cat. No. 5439, U.S.N.M.

CEROPLATUS CLAUSUS, new species.

Yellow, upper part of head brownish yellow, a black ocellar dot, the antennæ, four indistinct vittæ on mesonotum, one or two spots on pleura, a fascia at base of each segment of abdomen and knobs of halteres, brown; antennæ greatly compressed, the joints except last one wider than long; wings hyaline, a grayish brown spot fills the submarginal cell and encroaches on the adjoining cells; auxiliary vein extends considerably beyond base of third vein; auxiliary cross vein close to the humeral, upper branch of third vein ends in the first at about its length before apex of the latter, costa scarcely extending beyond apex of third vein, fifth vein forks considerably beyond base of the third; length, 7 to 8 mm. A specimen of each sex.

Habitat.—Franconia, New Hampshire (Mrs. A. T. Slosson), and New Brunswick, New Jersey (Dr. J. B. Smith).

Type.—Cat. No. 5440, U.S.N.M.

PLATYURA INOPS, new species.

Yellow, an ocellar dot and apices of abdominal segments black, most extended on the posterior segments, tarsi yellowish brown; antennæ subcylindrical, the third joint noticeably longer than broad (apical portion of antennæ wanting in all the specimens); wings hyaline, a grayish brown spot before apex of third vein; auxiliary vein extending a short distance beyond base of the third, auxiliary cross vein at about one-sixth of distance from the humeral to apex of auxiliary vein, upper branch of third vein ending in the costa at about one-third of distance from apex of first vein to apex of the third, costa extending nearly midway between apices of third vein and upper branch of the fourth, fifth vein forking beyond base of the third; length, 4.5 mm. Three male specimens, collected by Mr. C. W. Johnson.

Habitat.—Delaware Water Gap, New Jersey.

Type.—Cat. No. 5441, U.S.N.M.

TETRAGONEURA BICOLOR, new species.

Head black, first two joints of antennæ and the mouth parts yellow, remainder of antennæ dark brown; thorax and scutellum black, somewhat polished, the hairs reddish brown and black; abdomen yellow, its hairs also yellow; halteres, coxæ, femora, and tibiæ yellow, apices of tarsi brownish yellow; wings hyaline, auxiliary vein ending in the first about midway between the humeral cross vein and base of third vein, fifth vein forking close to its base; length, 3.5 mm. A female specimen, collected by Mrs. A. T. Slosson.

Habitat.—Franconia, New Hampshire.

Type.—Cat. No. 5442, U.S.N.M.

TETRAGONEURA PIMPLA, new species.

Head black, base of antennæ and the mouth parts yellow; body brown, two indistinct vittæ and lateral margins of mesonotum, a spot above front coxæ, posterior margins of second and following abdominal segments, and the genitalia, yellow; hairs and bristles of thorax black, those of abdomen chiefly yellowish brown; coxæ and femora yellow, tibiæ and tarsi brownish yellow, halteres yellow; wings grayish hyaline, the auxiliary vein ends in the first nearly midway between the humeral cross vein and base of third vein, fifth vein forks near its middle, at a point almost opposite the union of the small cross vein with the fourth vein; length, 4.5 mm. A female specimen, collected June 16, 1895, by Mr. C. W. Johnson.

Habitat.—Montgomery County, Pennsylvania.

Type.—Cat. No. 5443, U.S.N.M.

SCIOPHILA SUBCÆRULEA, new species.

Black, polished and strongly tinged with blue, the mouth parts brownish yellow, antennæ dark brown, a yellow spot on each prothoracic spiracle; coxæ, femora, and tibiæ, yellow, the tarsi brownish yellow, halteres yellowish brown, the apices and peduncles yellow; hairs of mesonotum short, depressed, yellow, those of the sides, head, and abdomen rather long and black; wings densely hairy, grayish hyaline, a brownish spot at the small cross vein and a second beneath apex of first vein; fifth vein forking before base of third, marginal cell about as broad as long; front tibiæ noticeably shorter than the first joint of their tarsi, middle femora each bearing a robust, outwardly directed spine on the under side a short distance before the apex.

Female.—Differs from the male as follows: Apical portion of antennæ beyond the seventh joint light yellow; abdomen, except the first segment and dorsum of the second, reddish yellow; coxæ, front tibiæ and their tarsi, also the hind femora except their ends black or brown; middle of middle femora brownish; the long hairs of head and body yellow; middle femora destitute of spines.

Length, 9 to 13 mm. Two males and two females.

Habitat.—Franconia, New Hampshire (Mrs. A. T. Slosson); North Mountain, Pennsylvania (Mr. C. W. Johnson); and Ottawa, Canada (Mr. W. H. Harrington).

Type.—Cat. No. 5444, U.S.N.M.

SCIOPHILA FLAVOHIRTA, new species.

Head black, the face and mouth parts yellow, first two joints of antennæ yellow, the remainder black, compressed, the third joint only slightly longer than broad; thorax and scutellum yellow, polished, the bristles and numerous, rather long hairs also yellow; abdomen polished, yellow, the bases of segments two to five, the whole of the sixth, and apex of abdomen, black; legs yellow, the tarsi brownish; halteres yellow; wings hyaline, marginal cell about twice as long as broad, fifth vein forking far before base of third; front tibiæ slightly longer than their tarsi; length, 5 mm. A male specimen, collected by Mrs. A. T. Slosson.

Habitat.—Franconia, New Hampshire.

Type.—Cat. No. 5445, U.S.N.M.

POLYLEPTA TIBIALIS, new species.

Head black, the face yellow and rather densely covered with bristly hairs; antennæ brown, the bases yellow, the third joint about twice as long as wide; mouth parts yellow, the penultimate and antepenultimate joints of palpi with a leaf-like prolongation at the upper side of their outer ends; thorax polished, yellow, two approximated vittæ on the mesonotum and a transverse row of three spots on the metanotum dark brown, the hairs and bristles black; scutellum brownish yellow; abdomen yellow, the broad apices of the segments, sometimes crossing the segment in the middle of the dorsum, dark brown; halteres and legs yellow, the tarsi yellowish brown; front tibiæ each with a deep groove before apex of anterior side, extending about one-third length of tibia; wings grayish hyaline, costal cell tinged with yellow, auxiliary vein obliterated at its apex, the cross vein slightly before base of third vein, fifth vein forking opposite the marginal cell; length, 5 mm. Three female specimens, collected by H. K. Morrison.

Habitat.—White Mountains, New Hampshire.

Type.—Cat. No. 5446, U.S.N.M.

I have also examined specimens collected by Mr. C. W. Johnson at Westville and Delaware Water Gap, New Jersey.

DOCOSIA LONGICORNIS, new species.

Yellow, the front, vertex, antennæ except the two basal joints, three vittæ on mesonotum, dorsum of first abdominal segment except a spot on each side, a fascia at base of remaining segments and the genitalia, black; tarsi becoming brown toward their apices; antennæ more than twice as long as the head and thorax, the third joint over twice as long as wide; body polished, its hairs and those of the coxæ and femora yellow; wings hyaline, the auxiliary vein ends in the first slightly beyond middle of first basal cell, small cross vein less than twice as long as first section of third vein, fifth vein forking before the small cross vein; length, 5 mm. A male specimen, collected by H. K. Morrison.

Habitat.—White Mountains, New Hampshire.

Type.—Cat. No. 5447, U.S.N.M.

DOCOSIA OBSCURA, new species.

Black, the halteres and legs yellow, bases of coxæ, femora on base of under side, and the tarsi, brown; third joint of antennæ only slightly longer than broad; body polished, the hairs yellow; bristles of hind tibiæ shorter than greatest diameter of the tibiæ; wings hyaline, veins brownish, auxiliary vein ends in the first, small cross vein at least four times as long as first section of third vein, fourth and fifth veins fork about opposite first section of the third, sixth vein almost reaching forking of the fifth; length, 3 to 3.5 mm. Three male specimens, collected by H. K. Morrison.

Habitat.—White Mountains, New Hampshire.

Type.—Cat. No. 5448, U.S.N.M.

DOCOSIA VITTATA, new species.

Head black, the face, mouth parts, and broad base of antennæ yellow, third joint of antennæ only slightly longer than broad; body polished, brown, a median vitta on the mesonotum, expanded at the front end and crossing the pleura, also middle of breast yellow, middle of metanotum reddish yellow; hairs of thorax black; halteres and legs yellow, changing into brown at apices of the tarsi; bristles of hind tibiæ longer than greatest diameter of the tibiæ; wings grayish hyaline, the auxiliary vein ends in the first, small cross vein about twice as long as first section of third vein, fifth vein forking far before the forking of the fourth, sixth vein reaching over one-fourth of its length beyond forking of the fifth; length, 4 mm. A male specimen, collected by Mrs. A. T. Slosson.

Habitat.—Franconia, New Hampshire.

Type.—Cat. No. 5449, U.S.N.M.

LEPTOMORPHUS PARVULUS, new species.

Yellow, a brownish ocellar spot, hind margins of second to fifth abdominal segments and whole of the sixth and seventh black, a black dot on each trochanter, tarsi toward the apices brown (antennæ beyond the third joint wanting in the single specimen under observation); body polished; hairs of thorax yellow; wings hyaline, the broad apices gray, sixth vein extending beyond middle of lower fork of the fifth; length, 3.5 mm. A male specimen, collected July 12, by Mr. C. W. Johnson.

Habitat.—Delaware Water Gap, New Jersey.

Type.—Cat. No. 5450, U.S.N.M.

LEPTOMORPHUS HYALINUS, new species.

Yellow, an ocellar dot and the mesonotum, except the lateral margin, interrupted above insertion of wings, black; antennæ, except the two basal joints, brown; abdomen with indications of an irregular brown fascia at apex of each segment; body polished; wings hyaline, densely short haired; length, 9 mm. Two female specimens, collected by H. K. Morrison.

Habitat.—White Mountains, New Hampshire.

Type.—Cat. No. 5451, U.S.N.M.

ACNEMIA FLAVEOLA, new species.

Yellow, the antennæ and tarsi becoming brown toward their apices, segments two to six of abdomen, each with a median brown fascia, shortest on the second and third, a brown dot on underside of each trochanter; bristles of tibiæ much shorter than greatest diameter of the tibiæ; wings hyaline; length, 3 mm. A female specimen, collected July 11, by Mr. C. W. Johnson.

Habitat.—Delaware Water Gap, New Jersey.

Type.—Cat. No. 5452, U.S.N.M.

EXECHIA ANALIS, new species.

Head black, the face, mouth parts, and base of antennæ yellow; thorax black, slightly polished, a small, triangular, yellow spot below the humeri; abdomen dark brown, the third and fourth segments, except hind margin of the latter, yellow; legs yellow, the broad apices of hind femora dark brown, tarsi brownish yellow, bristles of hind tibiæ noticeably longer than greatest diameter of the tibiæ; wings hyaline, a brown fascia fills apex of marginal cell and crosses the first posterior; length, 2 mm. A male specimen, collected July 8, by Mr. C. W. Johnson.

Habitat.—Delaware Water Gap, New Jersey.

Type.—Cat. No. 5453, U.S.N.M.

DYNATOSOMA THORACICA, new species.

Head black, upper part of face, base of antennæ, and the mouth parts yellow; thorax and scutellum black, subopaque; abdomen dark brown, the first four segments partly or wholly reddish yellow; halteres and legs yellow, tarsi brownish, anterior tibiæ each bearing about four downwardly directed spines at apex of outer side, the anterior spine the longest, nearly half as long as the tibial spur; many of the lateral bristles of middle and hind tibiæ much longer than greatest diameter of the tibiæ, those on inner side of the middle tibiæ shorter than greatest diameter of the latter; wings grayish hyaline, tinged with yellowish along the costa, fifth vein forking about opposite the small cross vein; length, 4 to 5 mm. Two males and two females.

Habitat.—Carlinville, Illinois (Mr. Charles Robertson); Mount Washington and Franconia, New Hampshire (Mrs. A. T. Slosson), and White Mountains, New Hampshire (H. K. Morrison).

Type.—Cat. No. 5454, U.S.N.M.

[*Mycetophila hopkinsii* Coquillett belongs more properly to the genus *Leja*, and *Neoglaphyroptera beringensis* Coquillett to *Boletina.*]

Family CHIRONOMIDÆ.

CERATOPOGON Meigen.

In order to facilitate the identification of the new species, their descriptions are given in the form of a synoptic table, as follows:

1. Third vein partly or wholly contiguous to the first, or connected with it by a cross vein 7
Third vein wholly separated from the first, wings bare, unspotted, penultimate joint of hind tarsi at most one-half as long as the last joint, tarsal claws equal or nearly equal in length 2
2. Last joint of hind tarsi bearing several spinous bristles on the under side, mesonotum polished 3
Last joint destitute of spinous bristles 4
3. Wings, including the veins, white. Head black, eyes widely separated, antennæ yellow, the apical half and the large basal joint brown, mouth parts brown; thorax and scutellum black, halteres whitish, abdomen yellow, legs whitish, apical half of femora, last tarsal joint, and apices of hind tibiæ black; femora slender, destitute of spinous bristles, first tarsal joint at least twice as long as the second, the latter slightly shorter than the last one; claws simple, about three-fourths as long as the last tarsal joint; third vein ending close to the extreme wing tip, fourth vein forking before the small cross vein; length, 2 mm.
elegans, new species.

A female specimen, collected May 14, by Mr. C. W. Johnson. Riverton, New Jersey.

Type.—Cat. No. 5455, U.S.N.M.

Wings hyaline, smoky brown in front of third vein, veins largely brown. Head black, eyes almost contiguous, face brownish yellow, antennæ white, the apical half brownish, the basal joint and mouth parts yellow; thorax and scutellum black, halteres and abdomen yellow, dorsum of segments 3 to 6 black, legs black, apices of coxæ, trochanters and bases of femora yellow, first four joints of tarsi whitish; femora slender, destitute of spinous bristles, tarsal joints and claws as in the preceding species; third vein ending close to wing tip, fourth forking close to small cross vein; length, 2 mm .... *smithi*, new species.

A female specimen, collected June 16, by Mr. C. W. Johnson; dedicated to Dr. J. B. Smith. Riverton, New Jersey.

Type.—Cat. No. 5456, U.S.N.M.

4. Mesonotum opaque 6

Mesonotum polished 5

5. Front femora each bearing 2 spinous bristles on apical half of under side, other femora destitute of them. Head and its members black (antennæ, except the first joint, wanting), eyes quite widely separated; mesonotum and scutellum black, pleura and abdomen dark brown, knob of halteres brown, legs dark brown, front femora almost wholly, the base and a ring before apex of front and middle tibiæ, also the tarsi except apices of the joints, light yellow; first joint of hind tarsi almost twice as long as the second; last joint about two-thirds as long as the second, claws simple, nearly half as long as last tarsal joint; wings hyaline, veins yellowish, apex of third vein at three-fourths length of wing, apex of first vein near middle of the third, fourth forking considerably beyond the small cross vein; length, 2 mm .... *expolitus*, new species.

A male specimen, collected July 3, by Mr. C. W. Johnson. Riverton, New Jersey.

Type.—Cat. No. 5457, U.S.N.M.

Front and other femora bearing spinous bristles on nearly the entire length of under side. Head black, eyes rather broadly separated, antennæ brown, sutures of the joints whitish, the basal joint yellowish brown, mouth parts dark brown; body black, knobs of halteres and legs dark brown, a ring before apex of each front femur, base of front tibiæ, a ring before apex of each front and middle tibia, also the tarsi, except apex of each joint, light yellow; first joint of hind tarsi nearly twice as long as the second, the latter slightly longer than the last one, claws more than half as long as last tarsal joint, one on each tarsi bearing a tooth near middle of under side; wings hyaline, pale grayish along the costa, apex of third vein near four-fifths length of wing, apex of first at one-third length of the third, fourth forking close to the small cross vein; length, 2.5 mm. *johnsoni*, new species.

A female specimen, collected July 3, by Mr. C. W. Johnson, for whom the species is named. Riverton, New Jersey.

Type.—Cat. No. 5458, U.S.N.M.

6. Under side of each front femur bearing at least 5, each middle femur about 2, each hind one about 4 spinous bristles. Head dark brown, eyes rather narrowly separated, antennæ brown, the basal half yellow at sutures of joints, palpi yellow, proboscis brown; thorax dark brown, light gray pruinose, a median brown vitta on anterior half and a transverse row of four elongated brown spots across the middle, scutellum yellow, knobs of halteres brown; abdomen black, opaque, thinly gray pruinose; legs dark brown, front and middle femora except their apices, usually the middle of the hind femora, front tibiæ except their apices, a ring before apices of middle and usually of the hind tibiæ, also the tarsi, except apices of the joints, light yellow; first tarsal joint almost twice as long as the second, the latter one and one-fourth times as long as the last one, claws slightly more than half as long as last tarsal joint, one on each tarsi bearing a tooth near middle of under side; wings hyaline, apex of third vein near four-fifths length of wing, apex of first slightly before middle of the third, fourth forking slightly before or at the small cross vein; length, nearly 3 mm. *pulvereus*, new species.

Three female specimens. Riverton, New Jersey (July 3, C. W. Johnson), and District of Columbia (D. W. Coquillett, in June).

Type.—Cat. No. 5459, U.S.N.M.

Under side of each femur bearing a single spinous bristle. Head black, eyes quite widely separated, antennæ brown, the basal half yellow at sutures of the joints, mouth parts dark brown; thorax dark brown, light gray pruinose, a dark brown median vitta on anterior half and a widely separated pair on the posterior half, scutellum yellow, knobs of halteres brownish yellow; abdomen dark brown, first two segments, except a pair of spots on the first and the posterior portion of the second, also the narrow hind margin of each segment, yellow; legs light yellow, the sutures brownish, coxæ dark brown; tarsi and wings as in the preceding species; length, 2 mm .... *barberi*, new species.

A female specimen, collected May 11, by Mr. H. S. Barber, for whom the species is named. Chesapeake Beach, Maryland.

Type.—Cat. No. 5460, U.S.N.M.

7. Wings hairy on at least the apical portion, tarsal claws simple, of an equal length, femora and tarsi not spinose 8

Wings bare, first tarsal joint at least one-half longer than the second 22

8. First tarsal joint at least one-half longer than the second 11

First joint shorter, or at most only slightly longer than the second, the latter at most one-third longer than the first, last two joints of nearly an equal length, empodia distinct, wings thickly covered with brown hairs, third vein united with the first nearly to apex of the latter, its apical portion separated from the costa, ending near middle of length of wing 9

9. Mesonotum opaque 10

Mesonotum polished. Head and its members brownish black, eyes contiguous, pubescence on apical portion of antennæ and at apex of palpi white; body black, its hairs brown, a yellowish spot on pleura in front of each wing, knobs of halteres whitish, legs brown, bases of tarsi yellow, middle and hind legs bearing many long hairs on under side of the femora, outer side of the tibiæ and upper side of the tarsi; wings hyaline, fourth vein forking beyond the small cross vein; length, 2 to 2.5 mm .... *specularis*, new species.

Four male specimens. Philadelphia (June 28) and Natrona, Pennsylvania (July 30, C. W. Johnson); Washington, District of Columbia (August 11, F. C. Pratt), and Colorado.

Type.—Cat. No. 5461, U.S.N.M.

10. Tibiæ bearing several lanceolate scales on the outer side. Head dark yellow, eyes contiguous, antennæ basally yellow, the remainder and mouth parts brown; thorax and scutellum dark yellow, abdomen dark brown, body thinly covered with short yellow hairs; knobs of halteres whitish; legs light yellow, destitute of long hairs; wings hyaline, short, broad, very blunt at apex; length, nearly 1 mm .... *fimbriatus*, new species.

A female specimen, collected August 11, by Mr. H. S. Barber. Washington, District of Columbia.

Type.—Cat. No. 5462, U.S.N.M.

Tibiæ destitute of scales. Head and body dark brown, a humeral spot extending upon the pleura almost to front coxæ, a spot beneath each wing, hind margins of abdominal segments 2 to 6, and ventral portion of first 4 or 5, light yellow; eyes contiguous, antennæ brownish yellow, the hairs in female largely whitish, in male dark brown, their apices whitish, mouth parts brownish yellow, body thickly covered with depressed light yellow hairs and brown and yellow long marginal hairs; legs light yellow, apices of middle and hind femora and bases of their tibiæ pale brownish, outer side of all tibiæ and upper side of hind tarsi beset with many unusually long yellow hairs; knobs of halteres yellowish white; wings hyaline, narrow and rather long; length, 1.5 to almost 2 mm. *pergandei*, new species.

A specimen of each sex, collected March 10 by Mr. Th. Pergande, for whom the species is named. Washington, District of Columbia.

Type.—Cat. No. 5463, U.S.N.M.

11. Apex of third vein near two-thirds or three-fourths length of wing, eyes contiguous 14

Apex near middle of length of wing, fourth forking beyond the small cross vein, empodia wanting 12

12. Wings not distinctly spotted, eyes contiguous 13

Wings covered with whitish hyaline and dark gray spots. Head black, eyes rather widely separated, antennæ black, base of flagellum yellowish, its joints except last two of nearly an equal length, noticeably longer than broad, mouth parts black; body black, opaque, mesonotum gray pruinose and covered with brown spots, halteres and legs brown, tibiæ bearing several rather long yellow hairs on outer side, a yellow ring before apices of front and middle femora and near bases of their tibiæ, tarsi largely yellow; wings nearly wholly covered with brown hairs, third vein contiguous to the first and to the costal vein, apical portion of first and third veins and costal vein near them greatly dilated, forming a darker spot than any of the others, fourth posterior cell whitish hyaline except a central triangular gray spot extending to the outer angles; length nearly 2 mm .... *variipennis*, new species.

Three female specimens. Westville, New Jersey (July 2, C. W. Johnson); Richmond, Virginia (Mrs. A. T. Slosson); and Mexico City, Mexico (O. W. Barrett).

Type.—Cat. No. 5464, U.S.N.M.

13. Mesonotum wholly densely gray pruinose, marked with three indistinct dark vittæ. Head black, antennæ and proboscis brown, palpi yellow; body black, the humeri, a large spot on pleura beneath wing, the scutellum, hind margins of abdominal segments, and the venter, yellow; halteres and legs yellow, sutures of the joints of latter brown; wings hyaline, almost wholly covered with brown hairs, third vein coalescing with the first nearly to apex of the latter, then extending close to the costa for a short distance; length, 1 mm. *griseus*, new species.

Two female specimens. Washington, District of Columbia (June 9, H. S. Barber); and Lake Worth, Florida (Mrs. A. T. Slosson).

Type.—Cat. No. 5465, U.S.N.M.

Mesonotum opaque black, somewhat velvety, in certain lights thinly whitish pruinose. Head and its members black, hairs of male antennæ brown, their apices whitish, body black, humeri, scutellum, and halteres light yellow, legs dark yellow; wings hyaline, almost wholly covered with brown hairs, third vein coalescent with the first nearly to apex of the latter, then extending a short distance close to the costal vein; length, 0.5 mm.. *mutabilis*, new species.

Five males and 14 females. Washington, District of Columbia (on windows, June 5 to 8, H. S. Barber); and Jacksonville, Florida (Mrs. A. T. Slosson).

Type.—Cat. No. 5466, U.S.N.M.

14. Empodia wanting 15

Empodia distinct, obovate, fringed with short bristles. Black, the legs brownish yellow, knobs of halteres whitish; joints 3 to 5 of antennæ broader than long, mesonotum polished (abraded ?), the front corners opaque, legs destitute of long hairs; wings hyaline, almost wholly covered with brown hairs, third vein connected by a cross vein with the first, elsewhere distinctly separated from it, reaching slightly beyond two-thirds length of wing, apex of first near two-fifths length of third, fourth forking beyond the small cross vein; length, slightly over 1 mm .... *websteri*, new species.

Four females collected April 17, 1887, by Prof. F. M. Webster, for whom the species is named. Ashwood, Louisiana.

Type.—Cat. No. 5467, U.S.N.M.

15. Wings unspotted, or at most with a few costal spots 18

Wings covered with gray and whitish markings 16

16. Markings of wings consist of many small whitish spots on a gray background. 17

Markings consist of a few gray, interrupted crossbands on a whitish hyaline background. Head black, antennæ and mouth parts brown; body black, humeri yellow, scutellum reddish brown, mesonotum opaque, densely gray pruinose, legs dark yellow, middle tibiæ outwardly fringed with rather long yellow bristly hairs, knobs of halteres yellow; wings nearly covered with brown hairs, whitish hyaline, a large gray costal spot near middle of costal cell extending to the fifth vein, an interrupted crossband at tip of first vein, extending to branching of the fifth, an irregular crossband beginning beyond apex of third vein and extending to apex of upper branch of the fifth, forming a border to apical portion of both branches of fourth vein; third vein separated from the first except at its middle where it coalesces for a considerable distance, costal vein greatly dilated from beginning of this union nearly to apex of third vein; length, 2 mm .... *cockerellii*, new species.

Three female specimens, collected by Prof. T. D. A. Cockerell, for whom the species is named. Custer County, Colorado.

Type.—Cat. No. 5468, U.S.N.M.

17. Upper branch of fourth vein marked with a distinct whitish spot a short distance from its base. Black, legs brown, a whitish ring before apex of each femur and both ends of each tibia, tarsi yellow, knobs of halteres yellow; mesonotum opaque, brown, 2 vittæ in the middle enlarging into a large spot on the posterior half, also a curved row of 3 spots in front of each wing, and the narrow lateral margins light gray pruinose; wings nearly wholly covered with brown hairs, gray, three darker costal spots, one near middle of costal cell, the second on the submarginal cells, the third beyond apex of third vein; a white spot on small cross vein, a costal spot near middle of first posterior cell and a transverse one at three-fourths the length of this cell, one near three-fourths length of second posterior cell, one below it in third posterior cell, another near middle of lower branch of fourth vein, one in center of fourth posterior cell, three in anal cell, and a very large one at base of wing; third vein narrowly separated from the first nearly to its middle where it unites for quite a distance, costal vein not dilated; length, 1 mm .. *guttipennis*, new species.

Six females, collected August 5 by Prof. James S. Hine, who reports that they bite severely. Medina, Ohio.

Type.—Cat. No. 5469, U.S.N.M.

Upper branch of fourth vein destitute of a white mark. Same as the preceding species with the above and following differences: No dark spot near middle of costal cell, a large whitish spot in base of first posterior cell, one in each end of the second posterior cell, none on lower branch of fourth vein, the one in center of fourth posterior cell extended to margin of wing, only two in anal cell, situated near its apex along the fifth vein; length, nearly 1 mm. *stellifer*, new species.

A female specimen, collected June 6 by Mr. H. S. Barber. Washington, District of Columbia.

Type.—Cat. No. 5470, U.S.N.M.

18. Mesonotum opaque 19

Mesonotum polished. Head black, face and mouth parts yellow, antennæ dark brown, thorax yellow, mesonotum, except the broad anterior corners and a large spot in front of scutellum, black, pleura spotted with brown; scutellum yellow, middle at base brown; abdomen dark brown, becoming yellowish at apex; legs yellow, destitute of long hairs, knobs of halteres light yellow; wings hyaline, bare except along the apex, third vein beyond its base narrowly separated from the first, but coalescing before its apex, first not extending to middle of third; length, 1 mm .... *levis*, new species.

A female specimen, collected May 13 by Mr. H. S. Barber. Marlboro, Maryland.

Type.—Cat. No. 5471, U.S.N.M.

19. Wings almost wholly covered with brown hairs 20

Wings bare except the apical fourth, which bears a few scattered brown hairs. Head brown, antennæ largely yellow, thorax and scutellum dark brown, mesonotum light gray pruinose, abdomen black, legs yellow, knobs of halteres whitish, wings pale grayish, indistinctly mottled with whitish, a small brown stigmal spot between two whitish ones, third vein beyond its base separated from the first, but at its middle coalescing for a short distance, first reaching two-thirds length of third and greatly dilated at its apex, as is also the costal vein at the same point; length, nearly 1 mm........ *sanguisuga*, new species.

A female specimen, collected May 13 by Mr. H. S. Barber, who reports that it was captured while in the act of biting him. Marlboro, Maryland.

Type.—Cat. No. 5472, U.S.N.M.

20. With no distinct white spots on wings 21

With a distinct white spot on the small cross vein and another at apex of third vein. Head, including its members, dark brown, thorax blackish brown, mesonotum gray pruinose, scutellum dark yellow, abdomen black, almost velvety, legs dark yellow, destitute of long hairs, knobs of halteres yellow, wings grayish hyaline, a darker stigmal spot, third vein beyond its base free from the first, at its middle coalescing for a considerable distance, first reaching three-fourths length of third, costal vein distinctly dilated at apex of first; length, 1 mm .... *biguttatus*, new species.

A female specimen, collected June 6 by Mr. H. S. Barber. Washington, District of Columbia.

Type.—Cat. No. 5473, U.S.N.M.

21. Thorax yellow. Yellow, sides of abdomen tinged with brown, second joint of hind tarsi two-thirds as long as the first, wings hyaline, third vein beyond its base narrowly separated from the first, at its middle coalescing for a short distance, first reaching three-fourths length of third, costal vein at apex of first greatly dilated; length, 1 mm .... *melleus*, new species.

A female specimen, collected by Mrs. A. T. Slosson. Lake Worth, Florida.

Type.—Cat. No. 5474, U.S.N.M.

Thorax black, the anterior corners yellow. Head black, antennæ and mouth parts brown, mesonotum gray pruinose, scutellum yellow, the middle brown, abdomen black, somewhat velvety, narrow hind margins of the segments yellow, legs dark yellowish, knobs of halteres brown, wings hyaline, third vein extending close to first and to costal vein, at its middle connected with first by a cross vein; length, 1 to 1.5 mm .... *cinctus*, new species.

Three female specimens, collected by Mrs. A. T. Slosson, who writes that she braved their biting in order to collect them. Lake Worth and Biscayne Bay, Florida.

Type.—Cat. No. 5475, U.S.N.M.

22. Hind tarsi each bearing a single very long claw which bears a small claw near base of under side, empodia wanting 25

Hind and other tarsi each bearing the usual pair of claws of an equal length. 23

23. Empodia wanting, last tarsal joint at least twice as long as the preceding 24

Empodia large, obovate, last tarsal joint only slightly longer than the preceding. Head black, face, mouth parts, and antennæ brown, hairs of male antennæ black, their apices yellowish, or almost wholly yellow, eyes contiguous; body black, the scutellum and genitalia of male brownish yellow, mesonotum slightly polished, knobs of halteres white, legs yellow, femora and tarsi not spined on under side, tarsal claws simple; wings hyaline, first vein nearly reaching middle of third, the latter beyond its base narrowly separated from the first, before apex of the latter connected with it by a cross vein, ending near three-fourths length of wing; fourth forking slightly beyond the small cross vein; length, 2 mm .... *fusculus*, new species.

Three males and four females. Washington, District of Columbia (May 12, F. C. Pratt); Riverton, New Jersey (April 30, C. W. Johnson); Mount Washington, New Hampshire (Mrs. A. T. Slosson); and Waldoboro, Maine (J. H. Lovell).

Type.—Cat. No. 5476, U.S.N.M.

24. Mesonotum opaque, densely light gray pruinose. Head black, eyes contiguous, mouth parts and basal joint of antennæ brown (remainder of antennæ wanting); thorax black, pleura thinly gray pruinose, scutellum brownish yellow, abdomen brown, rather densely whitish pruinose, legs blackish brown, tarsi yellow, apex of each joint and whole of last one black, claws very long, nearly straight, and with a pair of small claws near their bases, last tarsal joint bearing many long spinous bristles on the under side, femora slightly thickened toward their apices, each bearing 3 or 4 short spinous bristles toward apex of under side; wings hyaline, first vein almost reaching middle of third, the latter widely separated from the first, before apex of latter connected with it by a cross vein, reaching about five-sixths length of wing, fourth forking slightly before the small cross vein; length, 3.5 mm .... *schwarzii*, new species.

A female specimen, collected May 5 by Mr. E. A. Schwarz, for whom this fine species is named. Sharpsburg, Texas.

Type.—Cat. No. 5477, U.S.N.M.

Mesonotum somewhat polished but roughened, slightly rugose and granulose, not pruinose. Head brown, eyes widely separated, antennæ brown, the basal joint and mouth parts yellow; body black, halteres dark brown, legs yellow, apices of hind femora and of their tibiæ black, front femora noticeably thickened, each bearing about 5 short spines on the under side, middle and hind femora considerably thickened near the apex, each bearing two or three spines on the under side, last tarsal joint fringed along each side below with stout and rather long bristles, claws long, simple; wings hyaline, first vein reaching about to middle of the third, the latter widely separated from the first, only connected by a cross vein, apex of third near seven-eighths length of wing, fourth forking slightly before the small cross vein; length, 2 mm. *subasper*, new species.

Two female specimens. Marlboro, Maryland (May 13, H. S. Barber), and Mesilla, New Mexico (T. D. A. Cockerell).

Type.—Cat. No. 5478, U.S.N.M.

25. Front and middle tarsi each furnished with the usual pair of claws, of an equal length and not toothed 26

Front and middle tarsi each furnished with a single very long claw, which bears a small one near base of under side, last tarsal joint about twice as long as the preceding, femora destitute of spinous bristles, first vein reaching one-fifth length of the third, the latter separated but connected by a crossvein, apex of third near three-fourths length of wing.................................. 27

26. Wings marked with three brownish spots or bands, the first near center of first basal cell, the second beginning at basal part of third vein and extending to apex of lower branch of fifth, the last beginning on costa beyond apex of third vein and extending into the second posterior cell; also a small brownish spot near center of anal cell. Head and first antennal joint brownish black, remainder of antennæ yellow, the apex brown, the hairs yellow, tipped with brown; eyes contiguous; thorax black, mesonotum opaque, densely gray pruinose and marked with large, mostly confluent spots and isolated dots of brown; scutellum yellow, the front corners brown; abdomen polished, black, basal half of the dorsum yellowish, knobs of halteres whitish; legs brownish black, tarsi yellow, femora destitute of spinous bristles on the under side, hind tarsi on under side bearing a spine at base of first joint and a pair at apices of first two joints, last two joints of nearly an equal length, destitute of spinous bristles; first vein reaching about to middle of the third, the latter separated but connected by a crossvein; apex of third near three-fourths length of wing, fourth forking slightly beyond the small crossvein; length, nearly 2 mm.........................*nebulosus*, new species.

A male specimen, collected June 19 by Mr. C. W. Johnson. Riverton, New Jersey.

Type.—Cat. No. 5479, U.S.N.M.

Wings unmarked, hyaline. Brownish black, knobs of halteres whitish, tarsi yellow; joints three to five of antennæ broader than long, eyes very widely separated, mesonotum and abdomen highly polished, femora and tarsi destitute of spinous bristles on the under side, last tarsal joint almost twice as long as the preceding; first vein almost reaching middle of the third, the latter lying close to the first, with which it is connected by a crossvein; apex of third almost at two-thirds length of wing, lower branch of fourth obliterated at its base; length, 1 mm ....*politus*, new species.

A female specimen, collected April 2. Cambridge, Massachusetts.

Type.—Cat. No. 5480, U.S.N.M.

27. Abdomen green 28

Abdomen black. Black, the antennæ and legs yellow, first joint of antennæ and the mouth parts yellowish brown, middle and hind coxæ and their femora brown; eyes contiguous, antennæ nearly as long as the head and body, each joint, except the first, over twice as long as broad, mesonotum and abdomen highly polished, last joint of each tarsus bearing a transverse pair of blunt spines near base of under side; wings hyaline, fourth vein forking far beyond the small crossvein; length, 1.5 mm..................*antennalis*, new species.

Two females, collected by the writer in June. District of Columbia.

Type.—Cat. No. 5481, U.S.N.M.

28. Thorax and scutellum black. Head and its members yellow, eyes contiguous, antennæ, last tarsal joint, wings, and fourth vein as in the preceding species, mesonotum highly polished, halteres and legs light yellow; length, 1.5 mm. *diversus*, new species.

A female specimen, collected July 3 by Mr. C. W. Johnson. Riverton, New Jersey.

Type.—Cat. No. 5482, U.S.N.M.

Thorax and scutellum green. Head, eyes, antennæ, last tarsal joint, wings, and fourth vein as in the preceding species; abdomen marked with a transverse pair of elongate, velvet black spots on the third and fifth segments; halteres and legs light yellow, apices of hind femora and of their tibiæ black; length, 2 mm. .... *viridis*, new species.

A female specimen, collected June 16 by Mr. C. W. Johnson. Riverton, New Jersey.

Type.—Cat. No. 5483, U.S.N.M.

CHIRONOMUS BRACHIALIS, new species.

Male.—Head black, the face brownish yellow, mouth parts brown, first joint of antennæ black, the others yellow, hairs of antennæ pale yellow changing into white at their apices; thorax and scutellum black, polished; abdomen yellow, middle of dorsum of second segment, prolonged to the lateral margin at the hind end, on the front end extending entirely around the segment, narrow bases of the three succeeding segments and whole of the following ones, including the genitalia, brown; legs yellow, apex of front femora, front tibiæ and their tarsi except basal two-thirds of first joint, knees of other legs, apices of their tibiæ, sutures of first three tarsal joints and whole of the two following brown, front tarsi fringed with rather long hairs on outer side of second and third joints; wings bare, the basal portion hyaline and with yellow veins, the remainder grayish hyaline and with brownish veins, an indistinct darker brown spot on the small crossvein; halteres yellow. Length, 5 mm.

Female.—As in the male except that the first antennal joint is yellow, broad humeral region tinged with yellow, second and three following abdominal segments largely brownish (front tarsi wanting), wings with a broad brown crossband which in its outer portion includes the small crossvein.

Two males and one female, collected June 27 by Mr. C. W. Johnson.

Habitat.—Westville, New Jersey.

Type.—Cat. No. 5484, U.S.N.M.

CHIRONOMUS TÆNIAPENNIS, new species.

Yellow, tinged in places with green, especially on the abdomen, mouth parts, apical half of the femora, bases of front and middle tibiæ and nearly the whole of the hind ones brown, metanotum marked with a transverse pair of triangular brown spots; wings whitish, the costal cell from humeral crossvein to apex of auxiliary vein, a crossband extending from the latter point to hind margin of wing where it is greatly dilated, finally the apical fourth of wing black. Length, 4 mm. Two female specimens.

Habitat.—Andover, Massachusetts (June 14); and Delaware Water Gap, New Jersey (July 11, C. W. Johnson).

Type.—Cat. No. 5485, U.S.N.M.

CHIRONOMUS NITIDULUS, new species.

Head black, mouth parts yellow, antennæ except the basal joint yellow, the hairs whitish; body black, polished, the first two abdominal segments and the claspers yellow; legs yellow, the femora except their bases, front tibiæ wholly, and apices of hind ones brown, front tarsi bare; wings bare, whitish hyaline, the veins brown, halteres yellow; length, 2.5 mm. A male specimen, collected May 14 by Mr. C. W. Johnson.

Habitat.—Riverton, New Jersey.

Type.—Cat. No. 5486, U.S.N.M.

ORTHOCLADIUS PAR, new species.

Yellow, the antennæ except the basal joint, apices of front femora, of their tibiæ and of their first two tarsal joints, the whole of the remaining joints, also the last two on the other tarsi, brown, a pair of rather large black spots on abdominal segments 2 to 11; mesonotum marked with three darker yellow vittæ, hairs of antennæ bright yellow, becoming brownish at their apices; front tarsi destitute of long hairs, the fourth joint more than one-third as long as the first; wings bare, whitish hyaline, the portion in front of the first and third veins dark gray, the veins brownish; length, 6 mm. A male specimen, collected July 3 by Mr. C. W. Johnson.

Habitat.—Riverton, New Jersey.

Type.—Cat. No. 5487, U.S.N.M.

EURYCNEMUS SCITULUS, new species.

Yellow, the palpi, apices of antennæ, four vittæ on the mesonotum, a small spot below and slightly in front of each wing, the metanotum except the upper margin and sides, a broad fascia at base of abdominal segments 2 to 7, the knees, apices of tibiæ and of the tarsal joints, dark brown; mesonotum subopaque, front tarsi bare; wings almost wholly covered with brown hairs, grayish hyaline, the portion in front of the first and third veins pale brown, veins brown; length, 4 mm. A female specimen, collected April 30 by Mr. C. W. Johnson.

Habitat.—Riverton, New Jersey.

Type.—Cat. No. 5488, U.S.N.M.

TANYPUS JOHNSONI, new species.

Male.—Yellow, the scutellum, halteres, and tarsi white, apical joint of the latter, a band before apex of each femur and near base of each tibia brown, abdomen whitish, each segment with an irregular brown mark, composed principally of two median vittæ and a posterior arcuate fascia, most distinct on the median segments, on the apical ones expanded so as to cover nearly the entire dorsum; hairs of antennæ mixed pale yellow and brown, their apices chiefly whitish, mesonotum opaque, whitish pruinose, in certain lights three dark yellow vittæ are visible; front tarsi clothed with very short hairs, the first joint two-thirds as long as the tibia; wings whitish hyaline, almost wholly covered with yellow hairs, humeral cross vein bordered with brown, a broad pale brownish fascia crosses the wing just before the small cross vein, and a second slightly broader one at apex of first vein, fifth vein forking a short distance before the small cross vein; length, 3.5 mm.

Female.—Differs from the male as follows: Abdomen with dark yellow mottlings, destitute of brown markings, hairs of antennæ whitish, vittæ of mesonotum more distinct; length, 3 mm.

A specimen of each sex, collected June 17 and 18 by Mr. C. W. Johnson.

Habitat.—Riverton, New Jersey.

Type.—Cat. No. 5489, U.S.N.M.

TANYPUS BIFASCIATUS, new species.

Male.—Differs from *johnsoni* as follows: Front corners of scutellum brown, apical joint of tarsi white, no brown band on femora nor on tibiæ, brown of abdomen confined to a fascia at base of segments 2 to 6 and middle of dorsum of the seventh (front tarsi wanting), hairs of wings chiefly brown, humeral cross vein not bordered with brown, the first fascia lies beyond the small cross vein; length, 4 mm.

Female.—Hairs of antennæ whitish, abdomen yellow, destitute of brown markings, otherwise as in the male; length, 2.5 mm.

A specimen of each sex.

Habitat.—Riverton, New Jersey (April 30, C. W. Johnson); and Boston, Massachusetts.

Type.—Cat. No. 5490, U.S.N.M.

FAMILY EMPIDIDÆ.

EMPIS TRIDENTATA, new species.

Head black, gray pruinose, front of male at narrowest point less than width of lowest ocellus; antennæ black, the first two joints yellow, the third slightly over four times as long as wide, gradually tapering to the apex, nearly four times as long as the style, palpi and proboscis yellow, the latter almost twice as long as height of head; thorax yellow, a large black, gray pruinose spot in middle of hind part of mesonotum, sending three long prongs toward the head, the median one subopaque, the lateral ones polished, three small black spots beneath insertion of each wing, and a fourth bordering the mesothoracic spiracle and prolonged backward almost to the wing, hairs and bristles of thorax black, scutellum yellow, the base in the middle black, bearing four bristles; abdomen polished, yellow, bases of segments 2 to 4 or 5 usually black, most extended in the female, central filament of male hypopygium very sinuous; legs yellow, apices of tarsi brown, middle and hind femora beset with spinous bristles on the under side; wings hyaline, stigma brown, a brown cloud on base of upper branch of third vein, another on vein at base of second posterior cell, and one above forking of second and third veins; length, 5 to 6.5 mm. Two males and one female, collected June 12 by Mr. C. W. Johnson.

Habitat.—Delaware County, Pennsylvania.

Type.—Cat. No. 5491, U.S.N.M.

RHAMPHOMYIA CLAUDA, new species.

Male.—Head black, gray pruinose, eyes contiguous, antennæ black, the third joint five times as long as broad, nearly five times as long as the style, mouth parts brown, proboscis scarcely longer than height of head; thorax and scutellum black, opaque, gray pruinose, hairs and bristles black, scutellum bearing four bristles, abdomen dark brown, subopaque, hairs brown, hypopygium small, upper pieces usually yellow, gibbous, a clavate projection tipped with bristles in front of each clasper about half as long as the latter, central filament usually free except at apex, widely dilated near the middle; legs yellow, apices of tarsi, nearly the whole of hind ones, and sometimes of middle ones, hind femora except their bases, also a spot on under side of the hind trochanters, brown, all coxæ and greater part of femora sometimes brown; hind femora each greatly enlarged toward the apex, dilated before apex of anterior under side where it bears many black hairs; hind tibiæ greatly bent inward at the middle, suddenly dilated laterally on the basal third, bearing a small rounded lobe on the anterior inner side at one-fifth length of tibia from the base, beyond which is a large concavity reaching almost to middle of tibia; wings hyaline, veins brownish, stigma pale gray, sixth vein prolonged to the wing margin; halteres yellow; length 3.5 to 4 mm. Two specimens.

Habitat.—Clementon, New Jersey (May 10, C. W. Johnson); and Mount Washington, New Hampshire (Mrs. A. T. Slosson).

Type.—Cat. No. 5492, U.S.N.M.

RHAMPHOMYIA DIVERSA, new species.

Female.—Head black, gray pruinose, antennæ black, the third joint oval, scarcely one-half longer than broad, about three times as long as the style, mouth parts dark brown, proboscis scarcely longer than height of head; thorax black, opaque, gray pruinose, marked on mesonotum with three black vittæ, hairs and bristles black; scutellum black, gray pruinose, bearing four bristles; abdomen dark brown, subopaque, thinly gray pruinose, the hairs black; legs brown, the knees yellow, middle and hind femora ciliate on their upper and under sides, the hind tibiæ on their outer and inner sides with short flattened bristles; wings pale brown, darker in the costal and marginal cells, venation normal, sixth vein prolonged to the wing margin; halteres yellow; length, 4.5 mm. A single specimen, collected May 9 by Mr. C. W. Johnson.

Habitat.—Clementon, New Jersey.

Type.—Cat. No. 5493, U.S.N.M.

[RHAMPHOMYIA MACRURA Coquillett, 1900, not Loew, 1871.

Change name to *R. clavator* Coquillett, new name.]

Family SYRPHIDÆ.

CRIORHINA KINCAIDI, new species.

Head black, gray pruinose, a large brown pruinose spot above the antennæ, center of front and the cheeks polished, eyes at narrowest part of front as widely separated as the posterior ocelli, first two joints of antennæ black, the second slightly shorter than the first, but slightly longer than the third which is brownish yellow and about twice as wide as long, arista black, face deeply concave on its upper part, then strongly convex and with a prominent, rounded central tubercle, narrow sides of face along the eyes densely covered with long yellowish hairs, proboscis rather slender, rigid, the portion beyond the basal articulation slightly over half as long as height of head, narrow at the apex; thorax and scutellum black, densely yellow pilose, the posterior half of the mesonotum except the hind angles black pilose; abdomen black, yellow pilose, the third and fifth segments and genitalia largely black pilose; femora black, densely covered with long, chiefly yellow hairs, the hind femora strongly arcuate, not as robust as the others, tibiæ and tarsi brown, the hind tibiæ strongly arcuate; wings tinged with pale brown along the veins, the base and stigma yellowish; length, 23 mm. A male specimen, collected by Prof. Trevor Kincaid, for whom this fine species is named.

Habitat.—Seattle, Washington.

Type.—Cat. No. 5494, U.S.N.M.

Family SCATOPHAGIDÆ.

SCATOPHAGA NUBIFERA, new species.

Head black, face yellow, the cheeks, face, and sides of front gray pruinose, occiput brownish gray pruinose, a broad vertical dark brown stripe on the upper half, a velvet black circle around the ocelli, frontal vitta deep velvety brownish red; antennæ black, the first two joints and base of the third reddish yellow, arista bare, proboscis blackish, palpi yellow; body black, brownish pruinose, the hairs mostly yellowish, rather short and sparse, the dorsocentral bristles in front of the suture noticeably longer and stouter than the adjacent hairs, pteropleura hairy; hypopygium yellowish; coxæ and femora black, apices of the latter, the tibiæ and tarsi reddish yellow, femora destitute of bristles, the hairs chiefly yellow, rather short and sparse on the middle and hind ones, front tibiæ destitute of bristles, middle tibiæ each bearing one on the outer and two on the inner side below the middle, hind tibiæ each with two bristles on the inner side below the middle and two rows of about four each on the outer side, besides those at the tip; wings grayish, small and hind cross veins clouded with brown; length, 7 mm. A male specimen, collected July 13, 1882, by Mr. John Murdock.

Habitat.—Point Barrow, Alaska.

Type.—Cat. No. 5495, U.S.N.M.

SCATOPHAGA CRINITA, new species.

Differs from the above description of *nubifera* only as follows: Occiput bluish gray pruinose, no velvet black circle around the ocelli, frontal vitta reddish brown, antennæ black, extreme apex of second joint reddish brown, body bluish gray pruinose, hairs of mesonotum rather long, black, bristle like, those of the abdomen unusually long, crinkled, reddish yellow, dorsocentral bristles not stouter than many of the adjacent hairs, pteropleura bare, hypopygium and entire legs black, hairs of legs unusually long and rather abundant, middle tibiæ each bearing one or two stout bristles and several bristly hairs on the outer side, hind tibiæ destitute of bristles, wings grayish hyaline, cross veins not bordered with brown; length, 10 mm. A male specimen, collected in July or August, 1897, by Mr. Barrett-Hamilton.

Habitat.—Bering Island.

Type.—Cat. No. 5496, U.S.N.M.

HEXAMITOCERA FLAVIDA, new species.

Yellow, an ocellar dot and hind margins of the first three abdominal segments, black, bristles and most of the hairs also black; front much narrowed anteriorly, at the lower end less than half as wide as either eye, three pairs of fronto-orbitals, antennæ four-fifths as long as the face, the third joint only slightly longer than the second, arista bare; five pairs of dorsocentral bristles, two humeral, propleural and sternopleural bristles, three on hind margin of the mesopleura, pteropleura bare, scutellum bearing a very long median pair of macrochæta; all femora bristly, front tibiæ each bearing a bristle on the front and hind sides, middle tibiæ with one on the front and two on the hind side, hind ones each with two pairs on the outer side; wings hyaline, unmarked; length, 5 mm. A male specimen, collected by Mrs. A. T. Slosson.

Habitat.—Franconia, New Hampshire.

Type.—Cat. No. 5497, U.S.N.M.

PYCNOGLOSSA, new genus.

Form rather short and robust, head in profile somewhat trapezoidal, under side of the head strongly drawn upward at the anterior end, bearing about four strong bristles, vibrissæ well developed, face slightly concave, antennæ almost as long as the face, deflexed, the third joint somewhat oval, rounded at the apex, slightly longer than wide, about twice as long as the second, arista sub-basal, plumose nearly to the tip, the penultimate joint scarcely longer than broad; frontal bristles descending nearly to base of antennæ; eyes oval, cheeks less than one-fifth as wide as the eye-height; proboscis excessively large and thick, about as long as height of head, palpi slightly clavate, bearing a few short bristly hairs at the apex; thorax bearing five dorsocentrals, one præsutural, one intrahumeral, two humeral, two posthumeral, four supra-alar, two intra-alar, two propleural, a row along the hind margin of the mesopleura, and three sternopleural bristles; abdomen elongate oval; all femora and tibiæ bristly, no erect bristle on inner side of the front tibiæ; lower calypteres scarcely apparent, venation of wings practically as in *Scatophaga*, costa beset with rather short bristly spines, and with a longer pair at apex of the auxiliary vein.

Type, the following species:

PYCNOGLOSSA FLAVIPENNIS, new species.

Black, the halteres yellow, face, sides of front and greater part of cheeks gray pruinose, body somewhat polished; scutellum bearing four long bristles and a few short bristly hairs, pteropleura bare; wings unusually short and broad, strongly tinged with yellow, the veins also yellow; length, 5 mm. A female specimen, collected by Prof. O. B. Johnson.

Habitat.—Washington.

Type.—Cat. No. 5498, U.S.N.M.

PLETHOCHÆTA, new genus.

Differs from the above description of *Pycnoglossa* only as follows: Under side of head fringed with about ten bristles, antennæ three-fifths as long as the face, the third joint only slightly longer than the second, arista bare, proboscis small, about half as long as height of head, palpi at apex each bearing a black bristle as long as the palpi, costa of wings destitute of bristly spines.

Type, the following species:

PLETHOCHÆTA VARICOLOR, new species.

Head yellow, an ocellar spot and a transverse spot above center of occiput, black; face, cheeks, and sides of front whitish pruinose, frontal vitta dark yellow, changing above into yellowish brown; antennæ brownish black, the first two joints yellow; proboscis black, palpi yellow; thorax black, opaque, gray pruinose, the humeri and hind angles reddish yellow, pteropleura bare, scutellum reddish yellow, the upper surface brown, bearing a few short bristly hairs, a pair of very long submedian bristles, a pair of short basal ones, and a short apical pair; abdomen reddish yellow, the hind margins of first three segments and the genitalia brownish; legs yellow, tarsi brownish, front tibiæ each bearing one bristle on the front and one on the hind side, middle tibiæ with one on the inner, one on the front, and two on the hind side, hind tibiæ with one on the inner, three on the front, and four on the hind side; wings grayish hyaline, unmarked, halteres yellow; length, 8 mm. A female specimen, collected August 19, 1892, by Mr. C. W. Johnson.

Habitat.—Delaware County, Pennsylvania.

Type.—Cat. No. 5499, U.S.N.M.

Family HELOMYZIDÆ.

ANOROSTOMA OPACA, new species.

Head yellow, opaque, white pruinose, the front and upper part of the occiput tinged with bluish gray, a velvet black spot between the antennæ and each eye, antennæ brownish, the arista marked before its middle with a white ring, palpi yellow, proboscis brown; body brown, opaque, bluish gray pruinose, mesonotum with four, the pleura with one brownish pruinose vittæ; sternopleura bearing numerous short bristly hairs and with two stout bristles; legs yellow, opaque grayish pruinose except a polished spot at base of the posterior side of the first two pairs and a streak on the posterior side of the hind ones; wings whitish, marked with large pale gray spots and with a black cloud covering the small and hind crossveins, a small black spot beneath apex of auxiliary vein, one slightly before middle of antepenultimate section of the fourth vein, and several smaller spots on some of the other veins; the gray color fills the whole marginal cell beyond apex of auxiliary vein, nearly the entire second half of the submarginal, etc.; length, 7 mm. A female specimen captured by the writer.

Habitat.—Los Angeles County, California.

Type.—Cat. No. 5500, U.S.N.M.

Family SCIOMYZIDÆ.

TETANOCERA SETOSA, new species.

Head yellow, the face, cheeks, occiput, and narrow lateral margins of the front, white pruinose, an elongated brown spot below lower end of each eye, a brown ocellar dot, front opaque, a median line and streak at each lower corner, brown, antennæ yellow, the third joint orange yellow, slightly shorter than the very broad second joint, the latter bearing two strong spines near apex of upper side, the third joint considerably concave on the outer upper portion, arista black, long plumose, palpi yellow, proboscis brownish; body brown, thinly whitish pruinose, mesonotum marked with four brown vittæ, the median pair very narrow, a broad brown vitta on upper part of pleura and two on the scutellum; mesopleura covered with short hairs and with two bristles along the hind edge, pteropleura bearing one or two bristles, otherwise bare, sternopleura covered with short hairs and bearing a single bristle; halteres and legs yellow, apices of tibiæ brown; wings pale brownish, darker brown in the marginal cell, covered with pale yellowish and whitish dots and spots, the largest located in the marginal cell; length, 6 to 7 mm. Nine specimens, of both sexes.

Habitat.—New Bedford (Dr. Garry de N. Hough) and Barnstable (August 5, E. Burgess), Massachusetts and Georgia (H. K. Morrison).

Type.—Cat. No. 5501, U.S.N.M.

SCIOMYZA GUTTATA, new species.

Head yellow, upper part of occiput and three vittæ on upper half of front black, gray pruinose, a brown dot at base of each bristle, front opaque, two pairs of orbital bristles, a velvet black spot on each side of base of antennæ, the latter yellow, along the upper edge brown, arista brown, short plumose, mouth parts yellowish; body black, thickly dotted with brown, a brown vitta on upper part of pleura and one on the sternopleura, a brown spot in center of scutellum; posterior upper corner of mesopleura and upper portion of sternopleura bearing many short hairs, pteropleura bearing one or two bristles and a few hairs; legs brown, the front coxæ, a ring beyond middle of each middle and hind femur, the middle tibiæ except their apices, middle of each hind tibiæ and the middle and hind tarsi except their apices, yellow; knobs of halteres brown, the stems yellow; wings pale brownish, darker brown along outer half of costa and at apex, thickly covered with whitish hyaline dots except the apex, marginal cell beyond apex of first vein containing two pairs of whitish spots, and a small dot in its extreme apex; length 3 mm. A female specimen.

Habitat.—Texas.

Type.—Cat. No. 5502, U.S.N.M.

SCIOMYZA ALBOVARIA, new species.

Head yellow, upper part of occiput and three vittæ on the front black, gray pruinose, the median vitta reaching slightly below center of front and bordered each side with orange brown, the lateral ones each forming a tooth below the lowest of the two frontal bristles, below which it is very narrowly extended to lower end of the front, a black or brown spot on each side of base of antennæ, one on lower part of face, two on each cheek and one near middle of each occipital orbit; antennæ orange yellow, the arista brown, rather long plumose, its base and the mouth parts yellow, apices of palpi brown; thorax brown, grayish pruinose, mesonotum marked with four brown vittæ, a broad brown vitta on upper part of pleura and usually one on the sternopleura; mesopleura bare, a few short hairs above the front coxæ, pteropleura bearing one or two bristles and a few hairs, sternopleura covered with short hairs; scutellum yellowish, a central brown spot; abdomen polished, brown, apices of the segments and male genitalia yellowish, opaque, gray pruinose; legs of male yellow, bases of middle and hind coxæ and both ends of all femora and tibiæ brown, tarsi toward their apices brownish, the last joint yellowish-white; in the female the front femora and joints 2 to 4 of front tarsi blackish, 5 brown, 1 whitish; wings whitish hyaline, costal cell purer white, costal margin beyond apex of first vein continued around apex of wing, and a border to most of the veins except the first three, brown, veins brown, the humeral crossvein, auxiliary and first vein, except middle of the latter, usually the first section of the third, and the second vein from near its base to apex of the first, whitish; halteres yellow; length, 3 to 5 mm. Two males and three females.

Habitat.—New York (Nathan Banks); White Mountains, New Hampshire, and North Carolina (H. K. Morrison).

Type.—Cat. No. 5503, U.S.N.M.

NEUROCTENA FUMIDA, new species.

Head and its members yellow, the front, except its upper angles and an ocellar spot, dark velvety orange, shading below into light yellow; antennal arista pubescent, apically brown; thorax, scutellum, and legs reddish yellow, tarsi black; abdomen black, base of first segment and apex of abdomen beyond hind margin of fifth reddish yellow; halteres yellow; all hairs and bristles except those of the calypteres black; wings gray, the extreme bases yellowish, apex of first vein considerably beyond the small crossvein; length, 5.5 mm. A female specimen, collected August 17 by Prof. T. D. A. Cockerell.

Habitat.—Beulah, New Mexico.

Type.—Cat. No. 5504, U.S.N.M.

DRYOMYZA ARISTALIS, new species.

Head light yellow, front polished, a brown fascia on its lower part, face, except on the sides, highly polished, blackish brown, antennæ yellow, the third joint ellipsoidal, arista black, very thick at base, densely covered with long black hairs, clypeus not projecting, proboscis dark yellow, palpi yellowish, the apices brown; body reddish yellow, polished, one bristle and a few short hairs above each front coxæ, several short hairs on upper hind corner of the mesopleura, which is otherwise bare, pteropleura bearing one or two bristles and a few short hairs, sternopleura covered with short hairs but destitute of bristles; legs light yellow, a brown spot on apical portion of anterior side of each front femur, front tibiæ and their tarsi black, apices of other tarsi brown; wings hyaline, base of submarginal cell slightly before base of discal, apex of first vein opposite the small crossvein; all hairs and bristles, except those on the calypteres, black; length, 7 mm. A female specimen, collected by Mr. W. Hague Harrington.

Habitat.—Ottawa, Canada.

Type.—Cat. No. 5505, U.S.N.M.

Family PSILIDÆ.

PSILA FRONTALIS, new species.

Yellow, polished, the frontal triangle, reaching nearly to lower end of the front, black, polished, antennal arista and bristles of head and body black, the arista pubescent; antennæ slightly over half as long as face, the third joint one-half longer than broad, eyes slightly higher than long; wings yellowish hyaline, the veins yellow; length, 3 to 3.5 mm. Two males and one female, the latter collected by Mrs. Annie T. Slosson.

Habitat.—Franconia, New Hampshire.

Type.—Cat. No. 5506, U.S.N.M.

LOXOCERA FUMIPENNIS, new species.

Head yellow, three spots on upper part of occiput, the front except the orbits, and the face except a triangular spot in middle of lower part, black; front subopaque, the large triangle highly polished, antennæ linear, almost twice as long as the face, black, the second joint brown, arista nearly bare, yellow, the apical portion whitish; proboscis reddish, the palpi yellow; body polished, slightly scabrous, reddish yellow, a median vitta on mesonotum and a dorsal spot on the first abdominal segment, black; legs reddish yellow, apices of tarsi brown; halteres light yellow; wings smoky gray, sometimes nearly hyaline in some of the cells, unusually short and broad; length, 4 to 5.5 mm. Four males and two females.

Habitat.—Baldwin, Kansas (May, J. C. Bridwell); and Texas (Nathan Banks).

Type.—Cat. No. 5507, U.S.N.M.

Family DROSOPHILIDÆ.

PHORTICA VITTATA, new species.

Head yellow, a black ocellar dot, continued as a pale brown vitta attenuated anteriorly and reaching lower edge of the front, at which point is a black dot, a black dot beneath base of each antennæ, one at base of each vibrissa extending as a pale brown streak on the adjacent cheek, a black mark above insertion of the neck, antennæ and proboscis yellow, palpi velvet black; thorax and scutellum yellow, mesonotum polished, marked with 4 to 7 black vittæ, pleura marked with a broad black median vitta; abdomen yellow, middle of dorsum largely brown or black, most extended on the hind margins of the segments, two lateral vittæ, not visible from above, and apex of venter brown; legs whitish, a brown band near apex of each middle and hind femur; wings dark brown, becoming hyaline along the hind margin; halteres yellow; length, 3 to 4 mm. Three specimens.

Habitat.—Avalon (June 8), and Delaware Water Gap, New Jersey (July 12, C. W. Johnson); and New York (Nathan Banks).

Type.—Cat. No. 5508, U.S.N.M.

A LIST OF THE FERNS AND FERN ALLIES OF NORTH AMERICA NORTH OF MEXICO, WITH PRINCIPAL SYNONYMS AND DISTRIBUTION.

By William R. Maxon,

Aid in Cryptogamic Botany, Division of Plants.

In all the literature relating to American ferns and the so-called "fern allies," there have hitherto appeared but two systematic treatises of sufficiently wide scope to include the entire territory of North America north of Mexico, namely, the Ferns of North America, by Prof. D. C. Eaton (1877–1880), and Our Native Ferns and Their Allies (in several editions, 1881–1900), by Prof. L. M. Underwood. The first of these, a monograph of two large quarto volumes, contains descriptions and colored figures of all species comprised in the groups known at that time as the orders Filices and Ophioglossaceae. The treatment is full but concise, the style clear, the figures for the most part excellent; and the work as a whole must be regarded as the foundation for all subsequent studies of North American ferns. Without its good influence it is unlikely that the present degree of progress could have been attained; but we should remember first of all that it represents a critical estimate of the groups as they were understood over twenty years ago, and that since its appearance there has elapsed a period marked by unexampled botanical activity and progress. There has been collected in the meantime abundant material of many species either entirely new or then represented in herbaria by mere fragments, and with the aid of these specimens careful studies have been accomplished in the light of which not only new specific names have been proposed, but many changes in the older definitions of species have been shown to be desirable. If, then, we recognize that there have been and must continue to be many departures from the treatment contained in Professor Eaton's great work, we may escape that extreme conservatism which occasionally manifests itself in opposing innovation of almost any sort, and which regards the setting aside of an opinion there expressed as a proceeding hardly within the bounds of propriety.

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The cost of Professor Eaton's volumes has been such, unfortunately, as to place them beyond the reach of a majority of fern students; and largely on this account it has remained for Professor Underwood's attractive little book to really popularize the study of ferns within the United States. The first edition of the latter appeared in 1881, and was entitled Our Native Ferns and How to Study Them. It contained 116 pages, the first half being devoted to chapters on the haunts, habits, and distribution of ferns, their morphology and structure, methods of study, and the like; the remaining portion comprising a systematic arrangement of the groups treated by Eaton in his larger work. The second edition, made necessary by a remarkable demand for the first, appeared the following year under the slightly emended title, Our Native Ferns and Their Allies, preserving the general scheme of the former volume, but extending the systematic treatment to include the Equisetaceae, Marsileaceae, Salviniaceae, Lycopodiaceae, Selaginellaceae, and Isoëtaceae, which had merely been listed in the first edition. The third edition appeared in 1888, being practically an enlargement of the preceding. The fourth was issued in 1893, and contained a number of nomenclatorial changes—notably the substitution of Dryopteris for Aspidium—to bring the nomenclature to the standard set by the "Rochester code." The fifth edition (1896), except for the addition of a few species, is practically like the fourth. The sixth and last, which appeared in June, 1900, is extensively remodeled in conformity with the author's views as set forth in part in a Review of the Genera of Ferns proposed prior to 1832.[1] The most notable changes have to do with matters of nomenclature, though the systematic arrangement is also considerably modified and the number of species increased. It is hardly to be supposed that further studies will not result in additional changes; nevertheless nothing is more certain than that the present edition represents the most logical sequence of genera and the most reasonable estimate of our species that has yet been presented. Its general scheme has been followed closely in the preparation of the present paper.

Owing to the fact that Professor Underwood's is essentially a popular treatise, all citations are naturally and properly omitted. In the Ferns of North America, on the other hand, we have extensive but often incomplete bibliography under each species; but notwithstanding its incompleteness there has hitherto appeared no index of synonyms or compendium of any sort to take its place. The present list has been prepared, therefore, with the object of affording full citations for all the included species and for the more important synonyms. An especial effort has been made to insure the accurate citation of references to all original descriptions. It has been impossible to verify without exception every citation; but the number unverified is very small. The changes in the nomenclature of certain groups have been so extensive during the past few years as to necessitate devoting considerable space to their synonymy; but a constant aim has been to avoid the burden of useless bibliography. Such vernacular names as are in general use have been admitted, following the correct scientific name of the species and in the order of their importance.

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[1] Mem. Torr. Club 6: 247-283. 1899.

There is at least one other feature which has seemed to warrant the publication of this list in its present form, namely, the considerable amount of attention given nowadays to geographical distribution. Within the past twenty years we have had but three comprehensive lists relating to North American pteridophyta and dealing with this phase of fern study. The first of these, a Systematic Fern-list, was issued by Professor Eaton in 1880. Its scope is well explained in the supplementary title, A Classified List of the Known Ferns of the United States of America, with the Geographical Range of the Species. The disposition is practically that of the Ferns of North America. The second list, published by Mr. George E. Davenport in the Proceedings of the American Philosophical Society in 1883, applies only to the United States and Alaska. It contains an enumeration of the ferns only, some comparative tables showing their distribution state by state, and an interesting discussion of the range of certain species. The third, issued in 1895, by the Linnæan Fern Chapter, as Linnæan Fern Bulletin No. 9, is a list of the species of Pteridophyta of North America north of Mexico, without synonymy, but with distribution briefly indicated. These and the numerous other lists and papers mentioned below have been consulted in the preparation of this paper; but the ranges herein given have been determined chiefly by careful examination of the material in the U. S. National Herbarium, the herbarium of Columbia University, the herbarium of the New York Botanical Garden, and, in certain genera, the D. C. Eaton herbarium at Yale University and the herbarium of the California Academy of Sciences. Few records unsubstantiated by specimens have been allowed. Many wrong identifications have been corrected, and the utmost care has been taken to eliminate doubtful records, whether of old or recent standing.

The following summary will be found to contain a large proportion of the more important lists or extended papers on the distribution and systematic relationship of our species:

1829. Synoptical Tables of the Ferns and Mosses of the United States. Lewis C. Beck in the American Journal of Science **15**: 287–297.

1840. Acotyledonae [of North America]. Sir W. J. Hooker, Flora Boreali-Americana **2**: 258–270.

1843. Flowerless or Cryptogamous Plants [of New York State]. John Torrey, A Flora of the State of New York **2**: 480–514.

1844. A Monography of the North American Species of Equisetum. Alexander Braun in the American Journal of Science **46**: 81–91.

1847. On the North American Species of Isoëtes and Marsilea. Alexander Braun in the American Journal of Science II. 3: 52–56.

1848. Notes on some Ferns of the United States. G. Kunze in the American Journal of Science II. 6: 80–89.

1859. [Equisetaceae. Filices. Lycopodiaceae. Hydropterides]. D. C. Eaton in Report on the United States and Mexican Boundary Survey 2^1: 233–236.

1860. Filices [of the Southern United States]. D. C. Eaton in Chapman. Flora of the Southern United States ed. 1. 585–599.

1864. Synopsis of Canadian Ferns and Filicoid Plants. George Lawson in Canadian Naturalist II. 1: 262–310.

1864. Notes on the Habitats and Varieties of some Canadian Ferns. David R. McCord in Canadian Naturalist II. 1: 354–362.

1867. Filices [of the Northern United States]. D. C. Eaton in A. Gray, Manual of Botany of the Northern United States ed. 5. 655–672.

1870. [Review of Katharine M. Lyell's The Geographical Handbook of Ferns.] D. A. Watt in Canadian Naturalist II. 5: 343–349.

1873. Checklist of the Ferns of North America north of Mexico. John Robinson.

1875. Geographical Distribution of the Ferns of North America. John H. Redfield in Bulletin of the Torrey Botanical Club 6: 1–7.

1876. Catalogue of the Davenport Herbarium. George E. Davenport.

1876. Catalogue of North American Ferns. William Edwards. [Ed. 4. The third edition (1874) bears a slightly different title. A fifth edition appeared in 1879.]

1878. Ferns of Kentucky. John Williamson. [A local fern flora of 155 pages, containing illustrations of the species, and brief chapters on the structure, cultivation, collection, and study of ferns.]

1879. Catalogue of the "Davenport Herbarium" of North American Ferns . . . . George E. Davenport.

1879. Ferns of the Southwest. D. C. Eaton in Report U. S. Geographical Surveys West of One Hundredth Meridian 6: 301–340. [Volume 6 of this report is usually known as "Bot. Wheeler Survey." It bears date of 1878, but appeared first in May, 1879.]

1880. Systematic Fern-list; a Classified List of the Known Ferns of the United States of America, with the geographical range of the Species. Daniel C. Eaton.

1880. Vascular Acrogens [of California]. D. C. Eaton in Watson and Brewer, Botany of California 2: 329–352.

1882. Ferns of the Pacific Coast, including Arizona. J. G. Lemmon.

1882. The Genus Isoëtes in North America. George Englemann in Transactions of the St. Louis Academy of Science 4: 358–390.

1882. Ferns of the West. Marcus E. Jones.

1883. Some Comparative Tables showing the distribution of Ferns in the United States of America. George E. Davenport in Proceedings of the American Philosophical Society 20: 605–612.

1883. Catalogue of the Davenport Herbarium. Supplement. George E. Davenport.

1885. Canadian Filicineae. John Macoun and T. J. W. Burgess in Proceedings and Transactions of the Royal Society of Canada 2^4: 163–226.

1887. Notes on the American Species of Marsilea. L. M. Underwood and O. F. Cook in Bulletin of the Torrey Botanical Club 14: 89–94.

1887. Recent Additions to the Canadian Filicineae. . . . . T. J. W. Burgess in Proceedings and Transactions of the Royal Society of Canada 4^4: 9–18.

1888. The distribution of Isoëtes. L. M. Underwood in Botanical Gazette 13: 89–94.

1889. The Fern Flora of Canada. George Lawson. [This excellent work was reissued later in the same year under the title A School Fern Flora of Canada as an Appendix (pp. 221—251) to How Plants Grow, by Asa Gray].

1890. Catalogue of Canadian Plants. Part V. Acrogens. John Macoun.
1890. Vascular Acrogens or Pteridophytes [of the Northern United States]. D. C. Eaton in A. Gray, Manual of Botany of the Northern United States ed. 6. 675–701.
1895. Ferns and Evergreens of New England. Edward Knobel.
1895. The Pteridophyta of North America, north of Mexico. Linnæan Fern Bulletin No. 9, Willard N. Clute, editor.
1896. The Ferns and Fern Allies of New England. Raynal Dodge. [An excellent descriptive work of viii + 52 pages.]
1896. Pteridophyta [of the Northern United States, Canada . . . .]. L. M. Underwood in Britton and Brown, Illustrated Flora of the Northern United States, Canada . . . . **1**: 1–48.
1896. Ferns of Iowa and their Allies. T. J. Fitzpatrick.
1897. A Revision of the North American Species of Ophioglossum. Elizabeth G. Britton in Bulletin of the Torrey Botanical Club **24**: 545–559.
1898. Selaginella rupestris and its Allies. L. M. Underwood in Bulletin of the Torrey Botanical Club **25**: 125–133.
1898. American Ferns: I; the ternate species of Botrychium. L. M. Underwood in Bulletin of the Torrey Botanical Club **25**: 521–541.
1899. How to Know the Ferns. Frances Theodora Parsons. [An extremely popular account of the ferns of the northeastern United States; pp. 215.]
1900. A Review of the Species of Lycopodium of North America. F. E. Lloyd and L. M. Underwood in Bulletin of the Torrey Botanical Club **27**: 147–168.
1900. The Genus Isoëtes in New England. A. A. Eaton in Fernwort Papers 1–16.

The files of the Torrey Botanical Club, especially the early volumes, present an unusually large proportion of interesting short papers and notes. Special mention should be given of a long series by Mr. George E. Davenport, beginning in the sixth volume (1875), and embracing descriptions of many new species and notes on the discovery and distribution of many others. In the same journal Professor Eaton began with the fourth volume (1873) a series entitled New and Little-known Ferns of the United States, which extended to the tenth volume (1883). The files of the Botanical Gazette, the American Naturalist, the American Journal of Science, and several other serials are replete with references to our American species, as are also in many cases the publications of the various state geological surveys. The only journal devoted exclusively to the study of pteridophyta is The Fern Bulletin, published in Binghamton, New York, and beginning with 1901 its ninth volume. It was established in 1893 as the Linnæan Fern Bulletin, and from that time on has constituted the official organ of the Linnæan Fern Chapter, an organization of fern students becoming world-wide. Descriptions of many new species have appeared in this journal during the past few years.

The greater portion of the verification of citations following has been accomplished in the Library of Congress, the libraries of the Smithsonian Institution and the U. S. National Museum, and in the library of the Department of Agriculture. To Prof. E. L. Greene the author is indebted for many courtesies, and particularly for the use of his extensive library; to Mr. Willard N. Clute for the suggestion of the undertaking itself and for considerable assistance in its early stages; to Prof. L. M. Underwood and Mr. George E. Davenport for the completion or verification of many references, and especially to the former for many critical observations; to Mr. B. D. Gilbert for courtesies extended, especially in the study of specimens in his excellent private herbarium; to Mr. Frederick V. Coville, Mr. O. F. Cook, Dr. J. N. Rose, and Mr. Charles Louis Pollard for numerous helpful suggestions and criticisms; to Mr. Alvah A. Eaton for revising the Isoetaceae and Equisetaceae; and to several others who have courteously assisted by contributing specimens and data or by supplying references otherwise unavailable.

PTERIDOPHYTA Cohn.

Family I. OPHIOGLOSSACEAE Presl. Tent. Pterid. 10. 1836.

OPHIOGLOSSUM L. Sp. Pl. 1062. 1753.

Ophioglossum vulgatum L. Sp. Pl. 1062. 1753. ADDER'S-TONGUE.

Quebec and Ontario, south to Florida. Also in California.

Ophioglossum engelmanni Prantl. Jahrb. Kön. Bot. Gart. Berlin **3**: 318. *pl. 7. f. 17.* 1884.

Virginia, Kentucky, Indiana, and Missouri, southwest to Louisiana, Texas, and Arizona.

Ophioglossum arenarium E. G. Britton. Bull. Torr. Club **24**: 555. *pl. 318. pl. 319. f. 3.* 1897.

Holly Beach, New Jersey. Rockingham County, New Hampshire (*A. A. Eaton*).

Ophioglossum californicum Prantl. Jahrb. Kön. Bot. Gart. Berlin **3**: 315. *pl. 7. f. 11.* 1884.

Near San Diego, California (*Cleveland & Parry; Pringle*).

Ophioglossum alaskanum E. G. Britton. Bull. Torr. Club **24**: 556. *pl. 319. f. 5.* 1897.

Unalaska Island, Alaska (*Turner*).

Ophioglossum pusillum Nutt. Gen. **2**: 248. 1818.

Ophioglossum nudicaule Sturm; Mart. Fl. Bras. 1^2: 144. 1840, not L. f.
South Carolina to Florida, west to Louisiana. Also in Arizona.

Ophioglossum crotalophoroides Walt. Fl. Car. 256. 1788.

Ophioglossum bulbosum Michx. Fl. Bor. Am. **2**: 276. 1803.
South Carolina and Florida; Alabama, westward to Texas.

CHEIROGLOSSA Presl, Abh. Kön. Böhm. Gesell. Wiss. V. 4: 316. 1847.

Cheiroglossa palmata (L.) Presl. Abh. Kön. Böhm. Gesell. Wiss. V. **4**: 317. 1847.

Ophioglossum palmatum L. Sp. Pl. 1063. 1753.
Florida.

BOTRYCHIUM Sw. Schrad. Journ. Bot. **1800**^{2} : 8. 1801.

Botrychium pumicola Coville in Underw. Our Native Ferns ed. 6. 69. 1900.
Crater Lake, Oregon (*Coville & Applegate*).

Botrychium tenebrosum A. A. Eaton, Fern Bull. **7** : 8. 1899.
New Hampshire to Connecticut, Long Island (New York) and central New York.

Botrychium simplex E. Hitchcock, Am. Journ. Sci. **6** : 103. *pl. 8.* 1823. SNAKE-TONGUE.
New England to Quebec, west to Wyoming, California, and Oregon.

Botrychium lunaria (L.) Sw. Schrad. Journ. Bot. **1800**^{2} : 110. 1801. MOONWORT.
Osmunda lunaria L. Sp. Pl. 1064. 1753.
Newfoundland to Connecticut, central New York, Michigan, and Minnesota. Also in Alaska, and south in the mountains to Montana, Colorado, Utah, and California.

Botrychium boreale (Fries) Milde, Bot. Zeit. **15** : 880. 1857.
Botrychium lunaria var. *boreale* Fries, Herb. Normale **16** : 85.
Unalaska, Alaska.

Botrychium neglectum Wood, Class-book ed. 2. 816. 1860.
Botrychium matricariaefolium of American authors, not A. Br.; Döll. Rhein. Fl. 24. 1843.
Nova Scotia and New Brunswick to Maryland, Ohio, and South Dakota. Alaska to Washington.

Botrychium matricariae (Schrank) Spreng. Syst. Veg. **4** : 23. 1827.
Osmunda matricariae Schrank, Baier. Fl. **2** : 419. 1789.
Botrychium rutaceum Sw. Schrad. Journ. Bot. **1800**^{2} : 110. 1801.
Botrychium matricarioides Willd. Sp. Pl. **5** : 62. 1810.
Botrychium rutaefolium A. Br. in Döll. Rhein. Fl. 24. 1843.
Labrador to northern New England and central New York.

Botrychium biternatum (Lam.) Underw. Bot. Gaz. **22** : 407. *pl. 21.* 1896.
Osmunda biternata Lam. Encyc. **4** : 650. 1797.
Botrypus lunarioides Michx. Fl. Bor. Am. **2** : 274. 1803.
Botrychium lunarioides Sw. Syn. Fil. 172. 1806, not Gray.
Botrychium ternatum var. *lunarioides* D. C. Eaton, Ferns N. Am. **1** : 148. *pl. 20. f. 3.* 1878.
South Carolina to Florida and Louisiana.

Botrychium dissectum Spreng. Anleit. Kennt. Gewächse ed. 1. **3** : 172. 1804. GRAPE FERN. RATTLESNAKE FERN.
Botrychium ternatum var. *dissectum* D. C. Eaton, Ferns N. Am. **1** : 150. *pl. 20. f. 1.* 1878.
Maine to Virginia, Kentucky, Indiana, and Ohio.

Botrychium obliquum Muhl.; Willd. Sp. Pl. **5** : 63. 1810. GRAPE FERN. RATTLESNAKE FERN.
Botrychium ternatum var. *obliquum* D. C. Eaton, Ferns N. Am. **1** : 149. *pl. 20. f. 2.* 1878.
New Brunswick to Florida, Indiana, and Minnesota.

Botrychium obliquum intermedium (D. C. Eaton) Underw. Our Native Ferns ed. 6. 72. 1900. GRAPE FERN.

Botrychium ternatum var. *australe* subvar. *intermedium* D. C. Eaton, Ferns N. Am. 1 : 149. *pl. 20a* in part 187

New England and New York.

Botrychium silaifolium Presl, Rel. Haenk. **1** : 76. 1830.

Botrychium ternatum var. *australe* D. C. Eaton, Ferns N. Am. 1 : 149. *pl. 20a* in part. 1878. Not *Botrychium australe* R. Br.

California, Oregon, and British Columbia.

Botrychium coulteri Underw. Bull. Torr. Club **25** : 537. 1898.

Wyoming, the Yellowstone National Park, Montana, and Idaho.

Botrychium occidentale Underw. Bull. Torr. Club **25** : 538. 1898. WESTERN MOONWORT.

Oregon, Washington, and British Columbia.

Botrychium lanceolatum (S. G. Gmel.) Ångs. Bot. Notiser **1854** : 68. 1854.

Osmunda lanceolata S. G. Gmel. Nov. Comm. Acad. Sci. Petrop. **12** : 516. 1768.

Nova Scotia to New Jersey, Pennsylvania, Ohio, Michigan, and Alaska. Also in British Columbia, Washington, and Colorado.

Botrychium virginianum (L.) Sw. Schrad. Journ. Bot. **1800**^{2} : 111. 1801. RATTLESNAKE FERN. GRAPE FERN.

Osmunda virginiana L. Sp. Pl. 1064. 1753.

Botrychium gracile Pursh, Fl. Am. Sept. **2** : 656. 1814.

Nova Scotia and Labrador to British Columbia and Washington, south to Arizona, Texas, and Florida.

Family II. HYMENOPHYLLACEAE Gaud. in Bot. Freyc. Voy. 262. 1826.

TRICHOMANES L. Sp. Pl. 1097. 1753.

Trichomanes petersii A. Gray, Am. Journ. Sci. II. **15** : 326. 1853. PETERS' FILMY FERN.

Alabama: Winston County (*Peters, Underwood*); Black Creek Falls, Etowah County (*Mohr; Pollard & Maxon*); Marion County (*E. A. Smith*).

Trichomanes radicans Sw. Fl. Ind. Occ. **3** : 1736. 1806. BRISTLE-FERN.

Kentucky to Alabama and Florida.

Family III. SCHIZAEACEAE Reichenb. Consp. 39. 1828.

SCHIZAEA J. E. Smith, Mém. Acad. Roy. Sci. Turin **5** : 419. 1793.

Schizaea pusilla Pursh, Fl. Am. Sept. **2** : 657. 1814. CURLY-GRASS.

New Jersey, Nova Scotia, and Newfoundland. Rare and local.

LYGODIUM Sw. Schrad. Journ. Bot. 1800²: 106. 1801.

Lygodium palmatum (Bernh.) Sw. Syn. Fil. 154. 1806. CLIMBING FERN. HARTFORD FERN. CREEPING FERN. WINDSOR FERN. ALICE'S FERN.

Gisopteris palmata Bernh. Schrad. Journ. Bot. **1800²**: 129. 1801.

New Hampshire and Massachusetts to Florida. Also in Kentucky and Tennessee. Mainly coastal.

ORNITHOPTERIS Bernh. Schrad. Neues Journ. Bot. 1²: 40. 1806.

Ornithopteris adiantifolia (L.) Bernh. Schrad. Neues Journ. Bot. **1²**: 50. *pl. 3. f. 15. b.* 1806.

Osmunda adiantifolia L. Sp. Pl. 1065. 1753.

Anemia adiantifolia Sw. Syn. Fil. 157. 1806.

Florida.

Ornithopteris mexicana (Klotzsch) Underw. Our Native Ferns ed. 6. 76. 1900.

Aneimia mexicana Klotzsch, Linnaea **18**: 526. 1844.

Western Texas.

Family IV. OSMUNDACEAE R. Br. Prodr. Fl. Nov. Holl. 1: 161. 1810.

OSMUNDA L. Sp. Pl. 1063. 1753.

Osmunda regalis L. Sp. Pl. 1065. 1753. ROYAL FERN. FLOWERING FERN. QUEEN FERN. WATER FERN. BUCK-HORN FERN.

Newfoundland to Florida, west to Mississippi, Nebraska, and Saskatchewan.

Osmunda claytoniana L. Sp. Pl. 1066. 1753. INTERRUPTED FERN. CLAYTON'S FERN.

Osmunda interrupta Michx. Fl. Bor. Am. **2**: 273. 1803.

Newfoundland to Minnesota, south to North Carolina, Kentucky, and Missouri.

Osmunda cinnamomea L. Sp. Pl. 1066. 1753. CINNAMON FERN. BRAKES. WOOLLY FLOWERING-FERN. FIDDLE-HEADS.

Labrador to Newfoundland, Nova Scotia, and Minnesota, south to Florida, Louisiana, and New Mexico. The form known as var. *frondosa* is found with the type.

Family V. CERATOPTERIDACEAE Underw. Our Native Ferns ed. 6. 78. 1900.

CERATOPTERIS Brong. Bull. Soc. Philom. 1821: 184. 1821.

Ceratopteris thalictroides (L.) Brong. Bull. Soc. Philom. **1821**: 186. *pl.* [*1*]. 1821. FLOATING FERN.

Acrostichum thalictroides L. Sp. Pl. 1070. 1753.

Florida.

Family VI. POLYPODIACEAE Presl, Tent. Pterid. 167. 1836.

ACROSTICHUM L. Sp. Pl. 1067. 1753.

Acrostichum aureum L. Sp. Pl. 1069. 1753.
Southern Florida.

Acrostichum lomarioides Jenm. Bull. Bot. Dept. Jam. II. **5**:154. 1898.
Chrysodium lomarioides Jenm. Timehri **4**:314. 1885.
Southern Florida.

POLYPODIUM L. Sp. Pl. 1082. 1753.

Polypodium vulgare L. Sp. Pl. 1085. 1753. POLYPODY. POLYPOD.
Labrador and Newfoundland to Georgia, Alabama, Missouri, Manitoba, and Keewatin. Probably has a wider range toward the northwest.

Polypodium vulgare deceptum Maxon, nom. nov.
Polypodium vulgare forma *biserrata* Millsp. W. Va. Exp. Sta. Bull. **24**; 479. 1892. Not *Polypodium biserratum* Mart. & Gal.
Polypodium vulgare oreophilum Maxon in Morris, Proc. Biol. Soc. Wash. **13**:174. 1900. Not *Polypodium orophilum* Gandoger.
West Virginia.

Polypodium vulgare occidentale Hook. Fl. Bor. Am. **2**:258. 1840.
California to Alaska, along the coast.

Polypodium hesperium Maxon, Proc. Biol. Soc. Wash. **13**:200. 1900.
Arizona to Washington, British Columbia, and Montana.

Polypodium falcatum Kellogg, Proc. Cal. Acad. Sci. **1**:20. 1854.
Polypodium glycyrrhiza D. C. Eaton, Am. Journ. Sci. II. **22**:138. 1856.
California to British Columbia and Alaska.

Polypodium plumula H. & B.; Willd. Sp. Pl. **5**:178. 1810.
Florida.

Polypodium pectinatum L. Sp. Pl. 1085. 1753.
Southern Florida.

Polypodium polypodioides (L.) A. S. Hitchcock, Rep. Mo. Bot. Gard. **4**:156. 1893. GRAY POLYPODY. RESURRECTION FERN. TREE FERN.
Acrostichum polypodioides L. Sp. Pl. 1068. 1753.
Polypodium incanum Sw. Fl. Ind. Occ. **3**:1645. 1806.
Virginia to Florida, west to Iowa, Kansas, and Texas. On driftwood, Staten Island, New York (*Bastedo*).

Polypodium thysanolepis A. Br. in Klotzsch, Linnaea **20**: 392. 1847.
Huachuca Mountains, Arizona (*Lemmon*).

Polypodium californicum Kaulf. Enum. Fil. 102. 1824.
Polypodium intermedium Hook. & Arn. Bot. Beech. Voy. 405. 1841, not Muhl.
California. Extremely variable, presenting a number of forms.

Polypodium scouleri Hook. & Grev. Icon. Fil. **1**: *pl. 56.* 1829.
Polypodium carnosum Kellogg, Proc. Cal. Acad. Sci. **2**: 88. *f. 24.* 1861.
Polypodium pachyphyllum D. C. Eaton, Am. Journ. Sci. II. **22**: 138. 1856.
California to British Columbia.

PHLEBODIUM J. Sm. Journ. Bot. 4 : 58. 1842.

Phlebodium aureum (L.) J. Sm. Journ. Bot. **4** : 59. 1842. GOLDEN POLYPODY. RABBIT'S-FOOT FERN.
Polypodium aureum L. Sp. Pl. 1087. 1753.
Florida.

CAMPLYONEURON Presl, Tent. Pterid. 189. 1836.

Camplyoneuron phyllitidis (L.) Presl, Tent. Pterid. 190. *pl. 7. f. 18.* 1836.
Polypodium phyllitidis L. Sp. Pl. 1083. 1753.
Florida.

PHYMATODES Presl, Tent. Pterid. 195. 1836.

Phymatodes swartzii (Baker) Underw. Our Native Ferns ed. 6. 84. 1900.
Polypodium serpens Sw. Fl. Ind. Occ. **3** : 1633. 1806, not Forster.
Polypodium swartzii Baker in Hook. & Baker, Syn. Fil. ed. 1. 357. 1868.
Key Largo, Florida (*Curtiss; Pollard, Morris, & Collins*).

GYMNOPTERIS Bernh. Schrad. Journ. Bot. **1799**^{1} : 297. 1799.

Gymnopteris hispida (Mett.) Underw. Our Native Ferns ed. 6. 84. 1900.
Gymnogramme hispida Mett. in Kuhn, Linnaea **36** : 72. 1869–70.
Texas to Arizona.

Gymnopteris triangularis (Kaulf.) Underw. Our Native Ferns ed. 6. 84. 1900.
Gymnogramma triangulare Kaulf. Enum. Fil. 73. 1824.
California to British Columbia. Also in Arizona.

NOTHOLAENA R. Br. Prodr. Fl. Nov. Holl. **1** : 145. 1810.

Notholaena sinuata (Sw.) Kaulf. Enum. Fil. 135. 1824.
Acrostichum sinuatum Sw. Syn. Fil. 14. 1806.
Texas to Arizona.

Notholaena ferruginea Desv. Journ. Bot. Appl. **1** : 92. 1813.
Cincinalis ferruginea Desv. Mag. Gesell. Nat. Fr. Berlin **5** : 311. 1811.
Texas to Arizona.

Notholaena parryi D. C. Eaton, Am. Nat. **9** : 351. 1875.
Arizona and southern Utah to California.

Notholaena newberryi D. C. Eaton, Bull. Torr. Club **4** : 12. 1873. COTTON FERN.
Southern California.

Notholaena aschenborniana Klotzsch, Linnaca **20** : 417. 1847.
Huachuca Mountains (*Lemmon*) and Santa Rita Mountains (*Pringle*), Arizona; Texas (*Drummond*).

Notholaena candida (Mart. & Gal.) Hook. Sp. Fil. **5** : 110. 1864.
Cheilanthes candida Mart. & Gal. Mém. Acad. Brux. **15**^{5} : 73. *pl. 20.* 1842, in part.
Southern Texas and New Mexico

Notholaena cretacea Liebm. Mex. Breg. 64. 1849.
Southern California and Arizona.

Notholaena hookeri D. C. Eaton in U. S. Geog. Surv. W. 100th Merid. **6** : 308. *pl. 30.* 1879.
Texas to Arizona.

Notholaena grayi Davenp. Bull. Torr. Club **7** : 50. 1880.
Southeastern Arizona to Texas.

Notholaena lemmoni D. C. Eaton, Bull. Torr. Club **7** : 63. 1880.
Arizona.

Notholaena schaffneri (Fourn.) Underw.; Davenp. Garden & Forest **4** : 519. 1891.
Aleuritopteris schaffneri Fourn. Bull. Bot. Soc. France **27** : 328. 1880.
Notholaena nealleyi Seaton, Contrib. U. S. Nat. Herb. **1** : 61. 1890.
Western Texas.

Notholaena nivea Desv. Journ. Bot. Appl. **1** : 93. 1813.
Arizona and New Mexico.

Notholaena dealbata (Pursh) Kunze, Am. Journ. Sci. II. **6** : 82. 1848.
Cheilanthes dealbata Pursh Fl. Am. Sept. **2** : 671. 1814.
Notholaena nivea var. *dealbata* Davenp. Cat. Davenp. Herb. Suppl. 44. 1883.
Nebraska and Missouri to Arizona and New Mexico.

Notholaena fendleri Kunze, Farrnkr. **2** : 87. *pl. 136.* 1851.
Wyoming to New Mexico and Arizona.

Notholaena tenera Gillies; Hook. Curtis's Bot. Mag. **58** : *pl. 3055.* 1831.
Southern Utah, Arizona, and southern California.

CHEILOGRAMMA Blume, Fl. Javae 2 : 70. 1828.

Cheilogramma lanceolata (L.) Blume, Fl. Javae **2** : 70. 1828.
Pteris lanceolata L. Sp. Pl. 1073. 1753.
Taenitis lanceolata R. Br. Prodr. Fl. Nov. Holl. **1** : 154. 1810.
Old Rhodes Key, Florida (*Curtiss*).

VITTARIA J. E. Smith, Mém. Acad. Roy. Sci. Turin 5 : 413. 1793.

Vittaria lineata (L.) J. E. Smith, Mém. Acad. Roy. Sci. Turin **5** : 413. 1793. GRASS FERN.
Pteris lineata L. Sp. Pl. 1073. 1753.
Florida, as far north as Jacksonville.

ADIANTUM L. Sp. Pl. 1094. 1753.

Adiantum capillus-veneris L. Sp. Pl. 1096. 1753. VENUS-HAIR FERN. BLACK MAIDENHAIR.
Virginia to Florida, west to Missouri, Utah, California, and Texas. Also in the Black Hills, Dakota (*Bessey*), and New York (*Rous*).

Adiantum modestum Underw. Bull. Torr. Club **28** : 46. 1901.
Roswell, New Mexico (*F. S. Earle*).

Adiantum tenerum Sw. Fl. Ind. Occ. **3**:1719. 1806.
Florida.

Adiantum jordani C. Müll.; Kuhn, Jahrb. Kön. Bot. Gart. Berlin **1**:346. 1881.
Adiantum emarginatum Hook.; D. C. Eaton, Ferns N. Am. **1**:285. *pl. 38. f. 1–3.* 1879, not Bory.
California, New Mexico, Nevada, and Oregon.

Adiantum tricholepis Fée, 8^{me} Mém. Fam. Foug. 72. 1854–57.
Western Texas and New Mexico.

Adiantum pedatum L. Sp. Pl. 1095. 1753. MAIDENHAIR.*
Nova Scotia to British Columbia, south to Georgia, Mississippi, Arkansas, Kansas, Utah, and California. Also in Alaska.

PTERIS L. Sp. Pl. 1073. 1753.

Pteris longifolia L. Sp. Pl. 1074. 1753.
Florida.

Pteris cretica L. Mant. **1**:130. 1767.
Florida. Naturalized locally in Illinois.

Pteris serrulata L. f. Suppl. Pl. 445. 1781. RIBBON FERN. SPIDER FERN. SAW-LEAVED BRACKEN.
Alabama, Georgia, and South Carolina. Probably escaped from cultivation.

PTERIDIUM Scop. Fl. Carn. ed. 1. 169. 1760.

Pteridium aquilinum (L.) Kuhn in Decken's Reisen III. Bot. Ost-Afrika 11. 1879. BRAKE. BRACKEN. EAGLE FERN. UMBRELLA FERN. HOG BRAKES.
Pteris aquilina L. Sp. Pl. 1075. 1753.
Newfoundland and northern Quebec to northern Alabama, Missouri, and Manitoba.

Pteridium aquilinum pseudocaudatum Clute, Fern. Bull. **8**:39. 1900, as syn.
Long Island, New York, to northern Florida, Alabama, and Texas, but mainly confined to territory near the coast.

Pteridium aquilinum pubescens Underw. Our Native Ferns ed. 6. 91. 1900.
Pteris aquilina lanuginosa of American authors. Not *Pteris lanuginosa* Bory; Willd. Sp. Pl. **5**:403. 1810.
Arizona and California to British Columbia.

Pteridium caudatum (L.) Maxon, comb. nov.
Pteris caudata L. Sp. Pl. 1075. 1753.
Pteris aquilina var. *caudata* Hook. Sp. Fil. **2**:196. 1858.
Southern Florida.

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*Includes the var. *rangiferinum* Burgess, Proc. Roy. Soc. Canada **4**^{4}:11. 1887, an extreme form of the Pacific coast material, the most of which probably represents a species distinct from *A. pedatum.*

CHEILANTHES Sw. Syn. Fil. 126. 1806.

Cheilanthes californica (Nutt.) Mett. Abh. Senck. Nat. Gesell. **3**: 88. 1859–61. LACE FERN.
Aspidotis californica Nutt.; Hook. Sp. Fil. **2**: 71. 1858, as syn.
Hypolepis californica Hook. Sp. Fil. **2**: 71. 1858.
California.

Cheilanthes amoena A. A. Eaton, Fern Bull. **5**: 44. 1897.
Fresno County, California.

Cheilanthes wrightii Hook. Sp. Fil. **2**: 87. *pl. 110. A.* 1858.
Western Texas, Arizona, and New Mexico.

Cheilanthes pringlei Davenp. Bull. Torr. Club **10**: 61. *pl. 34.* 1883.
Southeastern Arizona.

Cheilanthes microphylla Sw. Syn. Fil. 127. 1806.
Florida, Texas, and New Mexico.

Cheilanthes alabamensis (Buckl.) Kunze, Linnaea **20**: 4. 1847.
Pteris alabamensis Buckl. Am. Journ. Sci. **45**: 177. 1843.
Virginia to Alabama, west to Illinois, Tennessee, Arkansas, Texas, and Arizona.

Cheilanthes viscida Davenp. Bull. Torr. Club **6**: 191. 1877.
Rather widely distributed in California, though rare.

Cheilanthes leucopoda Link, Fil. Sp. Hort. Berol. 66. 1841.
Texas.

Cheilanthes lanosa (Michx.) Watt, Journ. Bot. Brit. & Foreign **12**: 48. 1874.
Nephrodium lanosum Michx. Fl. Bor. Am. **2**: 270. 1803.
Cheilanthes vestita Sw. Syn. Fil. 128. 1806.
Connecticut and New York to Georgia, west to Kansas, Indian Territory, and Texas.

Cheilanthes cooperae D. C. Eaton, Bull. Torr. Club **6**: 33. 1875.
Central and southern California. Rare.

Cheilanthes gracillima D. C. Eaton in Rep. U. S. & Mex. Bound. Surv. **2**^{1}: 234. 1859.
Cheilanthes vestita Brack. in Wilkes's U. S. Explor. Exped. **16**: 91. 1854, not Sw.
British Columbia to Idaho and California.

Cheilanthes lendigera (Cav.) Sw. Syn. Fil. 128. 1806.
Pteris lendigera Cav. Descr. Pl. 268. 1802.
Huachuca Mountains, Arizona (*Lemmon*).

Cheilanthes feei Moore, Index Fil. xxxviii. 1857.
Myriopteris gracilis Fée, Gen. Fil. 150. 1850–52.
Cheilanthes gracilis Mett. Abh. Senck. Nat. Gesell. **3**: 80. 1859–61, not Kaulf.
Cheilanthes lanuginosa Nutt.; Hook. Sp. Fil. **2**: 99. 1858, as syn.
Illinois and Minnesota to British Columbia, south to Texas, New Mexico, and Arizona.

Cheilanthes tomentosa Link, Hort. Berol. **2**: 42. 1833. WOOLLY LIP-FERN.
Virginia to Georgia, west to Missouri, Texas, and Arizona.

Cheilanthes eatoni Baker in Hook. & Baker, Syn. Fil. ed. 1. 140. 1868.

Cheilanthes tomentosa var. *eatoni* Davenp. Cat. Davenp. Herb. Suppl. 49. 1883.

Arizona and Texas.

Cheilanthes fibrillosa Davenp. Bull. Torr. Club **12**: 21. 1885, as syn.

San Jacinto Mountains, California (*Parish*).

Cheilanthes parishii Davenp. Bull. Torr. Club **8**: 61. 1881.

San Diego County, California (*Parish*).

Cheilanthes fendleri Hook. Sp. Fil. **2**: 103. *pl. 107. B.* 1858.

Texas and Colorado to California.

Cheilanthes clevelandii D. C. Eaton, Bull. Torr. Club **6**: 33. 1875.

California.

Cheilanthes myriophylla Desv. Mag. Gesell. Nat. Fr. Berlin **5**: 328. 1811.

Cheilanthes elegans Desv. Mag. Gesell. Nat. Fr. Berlin **5**: 328. 1811.

Cheilanthes villosa Davenp. Cat. Davenp. Herb. Suppl. 45. 1883.

Texas to Arizona.

Cheilanthes lindheimeri Hook. Sp. Fil. **2**: 101. *pl. 107. A.* 1858.

Western Texas to Arizona.

Cheilanthes argentea (S. G. Gmel.) Kunze, Linnaea **23**: 242. 1850.

Pteris argentea S. G. Gmel. Nov. Comm. Acad. Sci. Petrop. **12**: 519. *pl. 12. f. 2.* 1768.

Alaska.

CRYPTOGRAMMA R. Br. App. Frankl. Journ. 767. 1823.

Cryptogramma acrostichoides R. Br. App. Frankl. Journ. 767. 1823. PARSLEY FERN.

Alaska and Mackenzie south to California, Colorado, and the northern shores of Lake Huron.

Cryptogramma stelleri (S. G. Gmel.) Prantl, Engler's Bot. Jahrb. **3**: 413. 1882. SLENDER CLIFF-BRAKE.

Pteris stelleri S. G. Gmel. Nov. Comm. Acad. Sci. Petrop. **12**: 519. *pl. 12. f. 1.* 1768.

Pellaea stelleri Watt, Can. Fil. No. 2. 1869–70.

Pteris gracilis Michx. Fl. Bor. Am. **2**: 262. 1803.

Pellaea gracilis Hook. Sp. Fil. **2**: 138. *pl. 133. B.* 1858.

Labrador to Alaska, south to Massachusetts, Pennsylvania, Illinois, Iowa, and in the Rocky Mountains to Colorado.

PELLAEA Link, Fil. Sp. Hort. Berol. 59. 1841.

Pellaea breweri D. C. Eaton, Proc. Am. Acad. **6**: 555. 1865.

Montana to Colorado, Nevada, Oregon, and California.

Pellaea occidentalis (E. Nelson) Rydberg, Mem. N. Y. Bot. Gard. **1**: 466. 1900.

Pellaea atropurpurea occidentalis E. Nelson, Fern Bull. **7**: 30. 1899.

Pellaea pumila Rydberg, Mem. N. Y. Bot. Gard. **1**: 4. 1900.

South Dakota to Wyoming and Washington.

Pellaea atropurpurea (L.) Link, Fil. Sp. Hort. Berol. 59. 1841. PURPLE-STEMMED CLIFF-BRAKE. BLUE FERN. WINTER BRAKE.

Pteris atropurpurea L. Sp. Pl. 1076. 1753.

Massachusetts, Vermont, and Ontario to British Columbia and Mackenzie, south to Georgia, Mississippi, Texas, Arizona, and California.

Pellaea aspera (Hook.) Baker in Hook. & Baker, Syn. Fil. ed. 1. 148. 1868.

Cheilanthes aspera Hook. Sp. Fil. **2** : 111. *pl. 108. A.* 1858.

Western Texas and New Mexico.

Pellaea andromedaefolia (Kaulf.) Fée, Gen. Fil. 129. 1850–52. Coffee fern.

Pteris andromedaefolia Kaulf. Enum. Fil. 188. 1824.

California and Arizona.

Pellaea pulchella (Mart. & Gal.) Fée, Gen. Fil. 129. 1850–52.

Allosorus pulchellus Mart. & Gal. Mém. Acad. Brux. **15**^{5} : 47. 1842.

Western Texas and New Mexico.

Pellaea marginata (H. B. K.) Baker in Hook. & Baker, Syn. Fil. ed. 1. 151. 1868.

Cheilanthes marginata H. B. K. Nov. Gen. et Sp. Pl. **1** : 22. 1815.

Huachuca Mountains, Arizona (*Lemmon*).

Pellaea ternifolia (Cav.) Link, Fil. Sp. Hort. Berol. 59. 1841

Pteris ternifolia Cav. Descr. Pl. 266. 1802.

Western Texas.

Pellaea brachyptera (Moore) Baker in Hook. & Baker, Syn. Fil. ed. 2. 477. 1873.

Platyloma brachypterum Moore, Gard. Chron. **1873** : 141. 1873.

California and Oregon.

Pellaea ornithopus Hook. Sp. Fil. **2** : 143. *pl. 116. A.* 1858. Bird's-foot cliff-brake. Black fern.

California.

Pellaea wrightiana Hook. Sp. Fil. **2** : 142. *pl. 115. B.* 1858.

Kansas to Texas, Arizona, and California. Extremely variable.

Pellaea densa (Brack.) Hook. Sp. Fil. **2** : 150. *pl. 125. B.* 1858.

Onychium densum Brack. in Wilkes's U. S. Explor. Exped. **16** : 120. *pl. 13. f. 2.* 1854.

British Columbia and Washington to Montana, Wyoming, Utah, and California. Also on Mt. Albert, Quebec, and in Grey County, Ontario (*Ami*).

Pellaea bridgesii Hook. Sp. Fil. **2** : 238. 1858.

California.

Pellaea flexuosa (Kaulf.) Link, Fil. Sp. Hort. Berol. 60. 1841.

Pteris flexuosa Kaulf.; Schlecht. & Cham. Linnaea **5** : 614. 1830, excl. syn.

Texas to California.

Pellaea intermedia Mett. in Kuhn, Linnaea **36** : 84. 1869–70.

Texas to Arizona.

STRUTHIOPTERIS Scop. Fl. Carn. ed. 1. 168. 1760.

Struthiopteris spicant (L.) Weiss, Pl. Crypt. 287. 1770. Deer fern. Hard fern.

Osmunda spicant L. Sp. Pl. 1066. 1753.

Lomaria spicant Desv. Mag. Gesell. Nat. Fr. Berlin **5** : 325. 1811.

Blechnum boreale Sw. Schrad. Journ. Bot. **1800**^{2} : 75. 1801.

Blechnum spicant J. E. Smith, Mém. Acad. Roy. Sci. Turin **5** : 411. 1793.

California to British Columbia and Alaska.

BLECHNUM L. Sp. Pl. 1077. 1753.

Blechnum serrulatum Richard, Act. Soc. Hist. Nat. Paris **1**: 114. 1792.
Florida.

WOODWARDIA J. E. Smith, Mém. Acad. Roy. Sci. Turin **5**: 411. 1793.

Woodwardia virginica (L.) J. E. Smith, Mém. Acad. Roy. Sci. Turin **5**: 412. 1793. CHAIN-FERN. BOG FERN.
Blechnum virginicum L. Mant. **2**: 307. 1771.
Nova Scotia to Ontario and Michigan, south to Florida, Louisiana, and Arkansas.

Woodwardia areolata (L.) Moore, Index Fil. xlv. 1857. NARROW-LEAVED CHAIN-FERN
Acrostichum areolatum L. Sp. Pl. 1069. 1753.
Woodwardia angustifolia J. E. Smith, Mém. Acad. Roy. Sci. Turin **5**: 411. 1793.
Maine to Florida, Louisiana, and Arkansas. Also in Michigan.

Woodwardia spinulosa Mart. & Gal. Mém. Acad. Brux. **15**^{5}: 64. 1842.
Woodwardia chamissoi Brack. in Wilkes's U. S. Explor. Exped. **16**: 138. 1854.
Woodwardia radicans var. *americana* Hook. Sp. Fil. **3**: 67. 1860.
California and Arizona. Also in Washington (*Flett*).

ASPLENIUM L. Sp. Pl. 1078. 1753.

Asplenium serratum L. Sp. Pl. 1079. 1753.
Florida.

Asplenium pinnatifidum Nutt. Gen. **2**: 251. 1818. PINNATIFID SPLEENWORT.
New Jersey and Pennsylvania to Georgia, Alabama, Missouri, and Arkansas. Rare and local.

Asplenium ebenoides R. R. Scott; Berkeley, Journ. Roy. Hort. Soc. **1866**: 87. 1866.
Vermont to Virginia. Also in Illinois and Alabama. Extremely rare and local.

Asplenium platyneuron (L.) Oakes; D. C. Eaton, Ferns N. Am. **1**: 24. 1878. EBONY SPLEENWORT. SCREW FERN.
Acrostichum platyneuros L. Sp. Pl. 1069. 1753.
Asplenium ebeneum Ait. Hort. Kew. **3**: 462. 1789.
Florida to Maine and southeastern Ontario, west to Texas and Colorado.

Asplenium parvulum Mart. & Gal. Mém. Acad. Brux. **15**^{5}: 60. *pl. 15. f. 3.* 1842. SMALL SPLEENWORT. LITTLE EBONY SPLEENWORT.
Virginia to Florida, west to Kansas, Texas, and Arizona.

Asplenium trichomanes L. Sp. Pl. 1080. 1753. DWARF SPLEENWORT. MAIDENHAIR SPLEENWORT. WALL SPLEENWORT. BABY FERN.
Nova Scotia and the eastern coast of Hudson Bay to Alabama, Texas, and Arizona, northwestward to Oregon, British Columbia, and Alaska.

Asplenium vespertinum Maxon, Bull. Torr. Club **27**: 197. 1900.
Southern California.

Asplenium monanthes L. Mant. **1**: 130. 1767.
Asplenium monanthemum L.; Murray, Syst. Veg. ed. 1. 933. 1784.
Huachuca Mountains, Arizona (*Lemmon*).

Asplenium viride Huds. Fl. Angl. 385. 1762. GREEN SPLEENWORT.

New Brunswick, northern Vermont and Quebec to Alaska, south to Oregon, Wyoming, and Colorado. Also in Greenland. Local.

Asplenium trichomanes-dentatum L. Sp. Pl. 1080. 1753.

Asplenium dentatum of authors.

South Carolina to Florida.

Asplenium angustifolium Michx. Fl. Bor. Am. **2**: 265. 1803. NARROW-LEAVED SPLEENWORT. SWAMP SPLEENWORT. KIDNEY FERN.

Northern New England and southern Quebec to Wisconsin, south to northern Georgia, Tennessee, and Missouri.

Asplenium firmum Kunze, Bot. Zeit. **3**: 283. 1845.

Florida and Arizona.

Asplenium septentrionale (L.) Hoffm. Deutsch. Fl. **2**: 12. 1795. FORKED SPLEENWORT.

Acrostichum septentrionale L. Sp. Pl. 1068. 1753.

Colorado, New Mexico, and Arizona; Black Hills of South Dakota (*Rydberg*).

Asplenium ruta-muraria L. Sp. Pl. 1081. 1753. WALL RUE. RUE SPLEENWORT.

Vermont, southern Ontario, and Michigan, south to Alabama and Missouri.

Asplenium montanum Willd. Sp. Pl. **5**: 342. 1810. MOUNTAIN SPLEENWORT.

Connecticut, New York, and Ohio, south to Georgia, Alabama, and Arkansas.

Asplenium glenniei Baker in Hook. & Baker, Syn. Fil. ed. 2. 488. 1873.

Huachuca Mountains, Arizona (*Lemmon*).

Asplenium fontanum (L.) Bernh. Schrad. Journ. Bot. **1799**^{1}: 314. 1799.

Polypodium fontanum L. Sp. Pl. 1089. 1753.

Lycoming County, Pennsylvania (*McMinn*); near Springfield, Ohio (*Spence*).

Asplenium bradleyi D. C. Eaton, Bull. Torr. Club **4**: 11. 1873.

New York to Georgia, Arkansas, and Missouri.

Asplenium myriophyllum (Sw.) Presl, Rel. Haenk. **1**: 48. 1830.

Caenopteris myriophyllum Sw. Fl. Ind. Occ. **3**: 1626. 1806.

Florida.

Asplenium cicutarium Sw. Prodr. Veg. Ind. Occ. 130. 1788.

Florida.

ATHYRIUM Roth, Tent. Fl. Germ. **3**: 58. 1800.

Athyrium thelypteroides (Michx.) Desv. Mém. Soc. Linn. Paris **6**: 266. 1827. SILVERY SPLEENWORT.

Asplenium thelypteroides Michx. Fl. Bor. Am. **2**: 265. 1803.

Asplenium acrostichoides Sw. Schrad. Journ. Bot. **1800**^{2}: 54. 1801. Not *Athyrium acrostichoideum* Bory; Merat, Fl. Paris ed. 4. **1**: 372. 1836.

Nova Scotia and New Brunswick to Minnesota, Illinois, Alabama, and Georgia.

Athyrium filix-foemina (L.) Roth. Tent. Fl. Germ. **3**: 65. 1800. LADY FERN. FEMALE FERN.

Polypodium filix-foemina L. Sp. Pl. 1090. 1753.

Asplenium filix-foemina Bernh. Schrad. Neues Journ. Bot. **1**^{2}: 26. 1806.

Newfoundland to Keewatin and British Columbia, south to Florida, Alabama, Indian Territory, Arizona, and California. Includes a large number of interesting forms, of which several are probably of subspecific rank.

Athyrium cyclosorum Rupr. Beitr. Pflanzenk. Russ. Reich. **3**: 41. 1845.

Athyrium filix-foemina var. *cyclosorum* Ledeb. Fl. Ross. **4**: 519. 1853.

Asplenium filix-foemina var. *cyclosorum* Rupr.; D. C. Eaton in U. S. Geog. Surv. W. 100th Merid. **6**: 331. 1879.

Alaska to California, Arizona, and Nebraska.

PHYLLITIS Ludwig, Inst. Hist. Phys. Reg. Veg. ed. 2. 142. 1757.

Phyllitis scolopendrium (L.) Newm. Hist. Brit. Ferns ed. 2. 10. 1844. HART'S-TONGUE. CATERPILLAR FERN. HOUND'S-TONGUE FERN.

Asplenium scolopendrium L. Sp. Pl. 1079. 1753.

Scolopendrium vulgare J. E. Smith, Mém. Acad. Roy. Sci. Turin **5**: 421. 1793.

Scolopendrium scolopendrium Karst. Deutsch. Fl. ed. 1. 278. 1880–83.

Central New York; Tennessee; New Brunswick; Grey and Simcoe counties, Ontario. Also in Alaska (?).*

CAMPTOSORUS Link, Hort. Berol. **2**: 69. 1833.

Camptosorus rhizophyllus (L.) Link, Hort. Berol. **2**: 69. 1833. WALKING LEAF. WALKING FERN. WALL LINK.

Asplenium rhizophylla L. Sp. Pl. 1078. 1753.

Maine and southern Quebec to Minnesota, south to Georgia, Alabama, and Kansas.

Camptosorus rhizophyllus intermedius Arthur, Bot. Gaz. **8**: 200. *pl. 3.* 1883.

Iowa.

PHEGOPTERIS Fée, Gen. Fil. 242. 1850–52.

Phegopteris phegopteris (L.) Underw.; Small, Bull. Torr. Club **20**: 462. 1893. LONG BEECH FERN.

Polypodium phegopteris L. Sp. Pl. 1089. 1753.

Phegopteris polypodioides Fée, Gen. Fil. 243. 1850–52.

Newfoundland to Alaska, south to Virginia, Michigan, Iowa (*Fitzpatrick*), and Washington. Also in Greenland.

Phegopteris hexagonoptera (Michx.) Fée, Gen. Fil. 243. 1850–52. BROAD BEECH FERN.

Polypodium hexagonopterum Michx. Fl. Bor. Am. **2**: 271. 1803.

New England and Quebec to Minnesota, south to Kansas, Louisiana, and Florida.

Phegopteris alpestris (Hoppe) Mett. Fil. Hort. Bot. Lips. 83. 1856. ALPINE POLYPODY.

Polypodium alpestre Hoppe, Taschenb. 216. 1805.

California to Montana and British Columbia.

Phegopteris dryopteris (L.) Fée, Gen. Fil. 243. 1850–52. OAK FERN.

Polypodium dryopteris L. Sp. Pl. 1093. 1753.

Newfoundland to Alaska, south to Virginia, Minnesota, Kansas, Colorado, and Oregon. Also in Greenland.

Phegopteris robertiana (Hoffm.) Underw. Our Native Ferns ed. 6. 109. 1900. LIMESTONE POLYPODY.

Polypodium robertianum Hoffm. Deutsch. Fl. **2**: [Add. 4.]. 1795.

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* Distribution discussed in Fernwort Papers 30–46. 1900.

Phegopteris dryopteris var. *robertianum* Davenp. Cat. Davenp. Herb. Suppl. 47. 1883.

Phegopteris calcarea Fée, Gen. Fil. 243. 1850–52.

Labrador to Quebec, Iowa, Minnesota, and Manitoba. Reported from Idaho.

Phegopteris tetragona (Sw.) Fée, Gen. Fil. 243. 1850–52.

Polypodium tetragonum Sw. Fl. Ind. Occ. **3**: 1670. 1806.

Marion County, Florida (*Reynolds*).

Phegopteris reptans (Sw.) D. C. Eaton, Bull. Torr. Club **10**: 101. 1883.

Polypodium reptans Sw. Fl. Ind. Occ. **3**: 1655. 1806.

Near Brooksville, Florida (*J. Donnell Smith*).

DRYOPTERIS Adans. Fam. Pl. 2: 20. 1763.

Dryopteris oreopteris (Sw.) Maxon, comb. nov. HEATH FERN.

Aspidium oreopteris Sw. Schrad. Journ. Bot. **1800**^{2}: 35. 1801.

Polypodium montanum J. A. Vogler, Dissert. Polyp. Mont. 1781, not Lam. 1778.

Dryopteris montana Kuntze, Rev. Gen. Pl. **2**: 813. 1891.

British Columbia (*Macoun*); Unalaska Island, Alaska (*Turner*); Washington (*Elmer*).

Dryopteris nevadensis (D. C. Eaton) Underw. Our Native Ferns ed. 4. 113. 1893.

Aspidium nevadense D. C. Eaton, Ferns N. Am. **1**: 73. *pl. 10.* 1878.

California and Oregon.

Dryopteris contermina strigosa (Fée) Underw. Our Native Ferns ed. 4. 113. 1893.

Aspidium strigosum Fée, Hist. Foug. et Lycop. Antilles 78. *pl. 22. f. 2.* 1866.

Aspidium conterminum var. *strigosum* D. C. Eaton, Bull. Torr. Club **7**: 62. 1880.

Florida.

Dryopteris noveboracensis (L.) A. Gray, Manual ed. 1. 630. 1848. NEW YORK FERN.

Polypodium noveboracense L. Sp. Pl. 1091. 1753.

Aspidium noveboracense Sw. Schrad. Journ. Bot. **1800**^{2}: 38. 1801.

Newfoundland to Ontario and Minnesota, south to northern Georgia, Alabama, and Arkansas.

Dryopteris simulata Davenp. Bot. Gaz. **19**: 497. 1894, as syn.

Aspidium simulatum Davenp. Bot. Gaz. **19**: 495. 1894.

Maine to Maryland. Reported also from Indian Territory and Missouri. Probably of wider range.

Dryopteris thelypteris (L.) A. Gray, Manual ed 1. 630. 1848. MARSH FERN. SNUFF-BOX FERN.

Acrostichum thelypteris L. Sp. Pl. 1071. 1753.

Aspidium thelypteris Sw. Schrad. Journ. Bot. **1800**^{2}: 40. 1801.

New Brunswick to Manitoba, south to Kansas, Texas, and Florida.

Dryopteris patens (Sw.) Kuntze, Rev. Gen. Pl. **2**: 813. 1891. SWEET FERN.

Polypodium patens Sw. Prodr. Veg. Ind. Occ. 133. 1788.

Aspidium patens Sw. Syn. Fil. 49. 1806.

Aspidium molle Sw. Schrad. Journ. Bot. **1800**^{2}: 34. 1801.

Florida and Alabama to California.

Dryopteris unita (L.) Kuntze, Rev. Gen. Pl. **2**: 811. 1891.

Polypodium unitum L. Sp. Pl. ed. 2. 1546. 1764.

Aspidium unitum var. *glabra* Mett. Ann. Mus. Bot. Ludg. Bat. **1**: 230. 1863–64. Not *Aspidium glabrum* Mett. Abh. Senck. Nat. Gesell. **2**: 343. 1856–58.

Florida.

Dryopteris fragrans (L.) Schott, Gen. Fil. 1834. Fragrant Fern.

Polypodium fragrans L. Sp. Pl. 1089. 1753.

Aspidium fragrans Sw. Schrad. Journ. Bot. **1800**^{2}: 35. 1801.

Labrador to Alaska, south to Maine, New Hampshire, Vermont, New York, Wisconsin, and Minnesota. Also in Greenland.

Dryopteris aquilonaris Maxon, Bull. Torr. Club **27**: 638. 1900.

Cape Nome, Alaska (*Flett*).

Dryopteris floridana (Hook.) Kuntze, Rev. Gen. Pl. **2**: 812. 1891.

Nephrodium floridanum Hook. Fil. Exot. *pl. 99.* 1859.

Aspidium floridanum D. C. Eaton in Chapm. Fl. So. U. S. ed. 1. 595. 1860.

Florida and Alabama.

Dryopteris cristata (L.) A. Gray, Manual ed. 1. 631. 1848. Crest fern. Crested shield fern.

Polypodium cristatum L. Sp. Pl. 1090. 1753.

Aspidium cristatum Sw. Schrad. Journ. Bot. **1800**^{2}: 37. 1801.

Newfoundland to Saskatchewan, south to Virginia, Arkansas, Nebraska, and Idaho.

Dryopteris cristata clintoniana (D. C. Eaton) Underw. Our Native Ferns ed. 4. 115. 1893.

Aspidium cristatum var. *clintonianum* D. C. Eaton in A. Gray, Manual ed. 5. 665. 1867.

Maine and Ontario to Wisconsin, south to Virginia (*Wm. Palmer*).

Dryopteris goldiana (Hook.) A. Gray, Manual ed. 1. 631. 1848. Goldie's fern.

Aspidium goldianum Hook. Edinb. Phil. Journ. **6**: 333. 1822.

New Brunswick to Minnesota, south to North Carolina, Tennessee, and Iowa.

Dryopteris goldiana celsa Palmer, Proc. Biol. Soc. Wash. **13**: 65. *pl. 1. f. 1–6. 8–12.* 1899. Log fern.

Dismal Swamp, Virginia (*Wm. Palmer; Bartsch.*).

Dryopteris filix-mas (L.) Schott, Gen. Fil. 1834. Male fern. Sweet fern.

Polypodium filix-mas L. Sp. Pl. 1090. 1753.

Aspidium filix-mas Sw. Schrad. Journ. Bot. **1800**^{2}: 38. 1801.

Nova Scotia and Newfoundland to Alaska, south to Michigan, South Dakota, Arizona, and California.

Dryopteris cristata × marginalis Davenp. Bot. Gaz. **19**: 497. 1894, as syn.

Aspidium cristatum × *marginale* Davenp. Bot. Gaz. **19**: 494. 1894.

All the New England States and New Jersey. Probably of wider distribution.

Dryopteris marginalis (L.) A. Gray, Manual ed. 1. 632. 1848. Marginal shield fern. Rock fern. Wood fern.

Polypodium marginale L. Sp. Pl. 1091. 1753.

Aspidium marginale Sw. Syn. Fil. 50. 1806.

Nova Scotia to British Columbia, south to Indian Territory, Arkansas, Alabama, and Georgia.

Dryopteris rigida arguta (Kaulf.) Underw. Our Native Ferns ed. 4. 116. 1893.

Aspidium argutum Kaulf. Enum. Fil. 242. 1824.

Aspidium rigidum var. *argutum* D. C. Eaton in U. S. Geog. Surv. W. 100th Merid. **6** : 333. 1879.

California to Alaska, chiefly near the coast.

Dryopteris spinulosa (Retz.) Kuntze, Rev. Gen. Pl. **2** : 813. 1891. SPINY SHIELD FERN.

Polypodium spinulosum Retz. Fl. Scand. ed 2. 250. 1795.

Aspidium spinulosum Sw. Schrad. Journ. Bot. **1800**^{2} : 38. 1801.

Newfoundland to Alaska, south to Virginia, Kentucky, Nebraska, and Washington.

Dryopteris spinulosa intermedia (Muhl.) Underw. Our Native Ferns ed. 4. 116. 1893. COMMON SPINY FERN.

Aspidium intermedium Muhl.; Willd. Sp. Pl. **5** : 262. 1810.

Aspidium spinulosum var. *intermedium* D. C. Eaton in A. Gray, Manual ed. 5. 665. 1867.

Dryopteris intermedia A. Gray, Manual ed. 1. 630. 1848.

Labrador to Alaska, south to North Carolina and Tennessee.

Dryopteris spinulosa dilatata (Hoffm.) Underw. Our Native Ferns ed. 4. 116. 1893. SPREADING WOOD-FERN.

Polypodium dilatatum Hoffm. Deutsch. Fl. **2** : 7. 1795.

Aspidium spinulosum var. *dilatatum* Hook. Brit. Fl. 444. 1830.

Dryopteris dilatata A. Gray, Manual ed. 1. 631. 1848.

Newfoundland to Alaska, south to California, Montana, and Virginia; mostly confined to the mountains.

Dryopteris boottii (Tuckerm.) Underw. Our Native Ferns ed. 4. 117. 1893. BOOTT'S WOOD-FERN.

Aspidium boottii Tuckerm. Hovey's Mag. Hort. **9** : 145. 1843.

Aspidium spinulosum var. *boottii* D. C. Eaton in A. Gray, Manual ed. 5. 665. 1867.

Nova Scotia, southern Ontario, and Minnesota, south to northern Virginia.*

Dryopteris patula (Sw.) Underw. Our Native Ferns ed. 4. 117. 1893.

Aspidium patulum Sw. Kongl. Vetensk. Akad. Handl. **1817** : 74. 1817.

Huachuca Mountains, Arizona (*Lemmon*).

POLYSTICHUM Roth, Tent. Fl. Germ. 3 : 69. 1800.

Polystichum acrostichoides (Michx.) Schott, Gen. Fil. 1834. CHRISTMAS FERN. EVERGREEN WOOD-FERN. SHIELD FERN.

Nephrodium acrostichoides Michx. Fl. Bor. Am. **2** : 267. 1803.

Aspidium acrostichoides Sw. Syn. Fil. 44. 1806.

Dryopteris acrostichoides Kuntze, Rev. Gen. Pl. **2** : 812. 1891.

Nova Scotia and New Brunswick to Wisconsin, Iowa, Mississippi, and Florida. The variable form known as var. *schweinitzii* (Beck), or the var. *incisum* A. Gray, has the range of the type.

Polystichum munitum (Kaulf.) Presl, Tent. Pterid. 83. 1836.

Aspidium munitum Kaulf. Enum. Fil. 236. 1824.

Dryopteris munita Kuntze, Rev. Gen. Pl. **2** : 813. 1891.

California, Oregon, and Idaho, northward to Alaska.

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* Reported from Loring, Alaska, by Miss Grace E. Cooley in Bull. Torr. Club **19**: 246. 1892.

Polystichum munitum imbricans (D. C. Eaton) Maxon, Fern Bull. **8**: 30. 1900.

Aspidium munitum var. *imbricans* D. C. Eaton, Ferns N. Am. **1**: 188. *pl. 25. f. 3.* 1878.

California to British Columbia.

Polystichum munitum inciso-serratum (D. C. Eaton) Underw. Our Native Ferns ed. 6. 116. 1900.

Aspidium munitum var. *inciso-serratum* D. C. Eaton, Ferns N. Am. **1**: 188. 1878.

California to British Columbia.

Polystichum lonchitis (L.) Roth, Tent. Fl. Germ. **3**: 71. 1800. HOLLY FERN.

Polypodium lonchitis L. Sp. Pl. 1088. 1753.

Aspidium lonchitis Sw. Schrad. Journ. Bot. **1800**^{2}: 30. 1801.

Dryopteris lonchitis Kuntze, Rev. Gen. Pl. **2**: 813. 1891.

Arctic America to Nova Scotia, southern Ontario, Wisconsin, Montana, and Washington, and in the mountains to Utah, Colorado, and California.

Polystichum scopulinum (D. C. Eaton) Maxon, Fern Bull. **8**: 29. 1900.

Aspidium aculeatum var. *scopulinum* D. C. Eaton, Ferns N. Am. **2**: 125. *pl. 62. f. 8.* 1880.

Washington to eastern Idaho, south to Utah and southern California. Also in Gaspé County, Quebec.

Polystichum lemmoni Underw. Our Native Ferns ed 6. 116. 1900.

Aspidium mohrioides of American authors, not Bory, Crypt. Voy. Duperr. 267. 1828.

California to Alaska.

Polystichum californicum (D. C. Eaton) Underw. Our Native Ferns ed. 6. 116. 1900.

Aspidium californicum D. C. Eaton, Proc. Am. Acad. **6**: 555. 1865.

Aspidium aculeatum var. *californicum* D. C. Eaton in U. S. Geog. Surv. W. 100th Merid. **6**: 336. 1879.

Dryopteris aculeata var. *californica* (D. C. Eaton) Underw. Our Native Ferns ed. 4. 112. 1893.

California to Washington.

Polystichum braunii (Spenner) Lawson, Fern Fl. Canada [19]. 1889. BRAUN'S HOLLY-FERN. PRICKLY-FERN.

Aspidium braunii Spenner, Fl. Frib. **1**: 9. 1825.

Aspidium aculeatum var. *braunii* Döll, Rhein. Fl. 21. 1843.

Dryopteris aculeata var. *braunii* (Spenner) Koch; Underw. Our Native Ferns ed. 4. 112. 1893.

Dryopteris braunii (Spenner) Underw. in Britt. & Br. Illustr. Fl. **1**: 15. 1896.

Nova Scotia to Alaska, south to British Columbia, Michigan, Pennsylvania, Vermont, New Hampshire, and Maine.

Polystichum aculeatum (L.) Roth, Tent. Fl. Germ. **3**: 79. 1800.

Polypodium aculeatum L. Sp. Pl. 1090. 1753.

Aspidium aculeatum Sw. Schrad. Journ. Bot. **1800**^{2}: 37. 1801.

Dryopteris aculeata Kuntze, Rev. Gen. Pl. **2**: 812. 1891.

California to Washington.

PHANEROPHLEBIA Presl, Tent. Pterid. 84. 1836.

Phanerophlebia auriculata Underw. Bull. Torr. Club **26**: 212. *pl. 359. f. 3–4. pl. 360. f. 2.* 1899.

Aspidium juglandifolium in part of recent authors, not Kunze; Klotzsch, Linnaea **20**: 363. 1847.

Arizona to Texas.

TECTARIA Cav. Descr. Pl. 249. 1802.

Tectaria trifoliata (L.) Cav. Descr. Pl. 249. 1802.

Polypodium trifoliatum L. Sp. Pl. 1087. 1753.
Aspidium trifoliatum Sw. Schrad. Journ. Bot. **1800**^{2}: 30. 1801.
Dryopteris trifoliata Kuntze, Rev. Gen. Pl. **2**: 814. 1891.

Florida and western Texas.

NEPHROLEPIS Schott, Gen. Fil. 1834.

Nephrolepis exaltata (L.) Schott, Gen. Fil. 1834. SWORD FERN.

Polypodium exaltatum L. Sp. Pl. ed. 2. 1548. 1763.
Aspidium exaltatum Sw. Schrad. Journ. Bot. **1800**^{2}: 32. 1801.

Florida.

Nephrolepis biserrata (Sw.) Schott, Gen. Fil. 1834.

Aspidium biserratum Sw. Schrad. Journ. Bot. **1800**^{2}: 32. 1801.
Aspidium acutum Sw. Syn. Fil. 46. 1806.
Nephrolepis acuta Presl, Tent. Pterid. 79. 1836.

Southern Florida.

FILIX Adans. Fam. Pl. 2: 20. 1763.

Filix bulbifera (L.) Underw. Our Native Ferns ed. 6. 119. 1900. BLADDER-FERN.

Polypodium bulbiferum L. Sp. Pl. 1091. 1753.
Cystopteris bulbifera Bernh. Schrad. Neues Journ. Bot. **1**^{2}: 26. 1806.

Newfoundland to Manitoba and Iowa, south to North Carolina, Alabama, and Arkansas. Also in Alaska.

Filix fragilis (L.) Underw. Our Native Ferns ed. 6. 119. 1900. BRITTLE FERN. BRITTLE BLADDER-FERN.

Polypodium fragile L. Sp. Pl. 1091. 1753.
Cystopteris fragilis Bernh. Schrad. Neues Journ. Bot. **1**^{2}: 27. 1806.

Newfoundland and Labrador to Alaska, south to southern California, Arizona, Kansas, Alabama, and Georgia. Extremely polymorphic, but apparently presenting no geographic subspecies. Also in Greenland.

Filix montana (Lam.) Underw. Our Native Ferns ed. 6. 119. 1900.

Polypodium montanum Lam. Fl. Franc. **1**: 23. 1778.
Cystopteris montana Bernh. Schrad. Neues Journ. Bot. **1**^{2}: 26. 1806.

Labrador and Quebec to British Columbia and Alaska, south to the northern shore of Lake Superior. Also in Colorado. Rare.

ONOCLEA L. Sp. Pl. 1062. 1753.

Onoclea sensibilis L. Sp. Pl. 1062. 1753. SENSITIVE FERN. OAK-LEAVED FERN.

Newfoundland to Saskatchewan, south to Nebraska, Louisiana, and Florida. The var. *obtusilobata* of Torrey comprises plants of which one or more of the fertile fronds are more or less foliose.

MATTEUCCIA Todaro, Syn. Pl. Acot. Vasc. Sicilia 30. 1866.

Matteuccia struthiopteris (L.) Todaro, Syn. Pl. Acot. Vasc. Sicilia 30. 1866.

Osmunda struthiopteris L. Sp. Pl. 1066. 1753.
Struthiopteris germanica Willd. Enum. Pl. Hort. Bot. Berol. 1071. 1809.
Onoclea struthiopteris Hoffm. Deutsch. Fl. **2** : 11. 1795.

Nova Scotia to Virginia, west to Iowa and British Columbia.

WOODSIA R. Br. Prodr. Fl. Nov. Holl. 1 : 158. 1810.

Woodsia ilvensis (L.) R. Br. Prodr. Fl. Nov. Holl. **1** : 158. 1810. RUSTY WOODSIA.

Acrostichum ilvense L. Sp. Pl. 1071. 1753.

Labrador to Alaska, south to North Carolina, Kentucky, and Minnesota. Also in Greenland.

Woodsia alpina (Bolton) S. F. Gray, Nat. Arr. Brit. Pl. **2** : 17. 1821. ALPINE WOODSIA.

Acrostichum alpinum Bolton, Fil. Brit. 76. *pl. 42.* 1790.
Acrostichum hyperboreum Liljeb. Kongl. Vetensk. Akad. Nya Handl. **14** : 201. 1793.
Woodsia hyperborea R. Br. Prodr. Fl. Nov. Holl. **1** : 158. 1810.

Labrador to Alaska, south to Maine, Vermont, northern New York and western Ontario. Also in Greenland.

Woodsia glabella R. Br. App. Frankl. Journ. 754. 1823.

Central New York and Vermont to New Brunswick, westward in Canada to British Columbia, northward to Alaska and Mackenzie. Also in Greenland.

Woodsia scopulina D. C. Eaton, Can. Nat. II. **2** : 91. 1865.

Michigan and western Ontario to British Columbia, south in the mountains to Arizona and California. Also in Alaska.

Woodsia oregana D. C. Eaton, Can. Nat. II. **2** : 90. 1865.

British Columbia and Athabasca, to Manitoba, Nebraska, Oklahoma, Colorado, Arizona, and California. Also in Wisconsin and northern Michigan.

Woodsia obtusa (Spreng.) Torr. Cat. Pl. in Geol. Rep. N. Y. 195. 1840.

Polypodium obtusum Spreng. Anleit. Kennt. Gewächse ed. 1. **3** : 92. 1804.

Nova Scotia to Wisconsin and Nebraska, south to Georgia, Alabama, and Texas. Also in Alaska and British Columbia.

Woodsia obtusa plummerae (Lemmon) Maxon, comb. nov.

Woodsia plummerae Lemmon, Bot. Gaz. 7 : 6. 1882.

Woodsia obtusa var. *glandulosa* D. C. Eaton & Faxon, Bull. Torr. Club 9 : 50. 1882.

New Mexico and Arizona.

Woodsia mexicana Fée, 7^{me} Mém. Fam. Foug. 66. 1854.

Texas, New Mexico, and Arizona.

DENNSTAEDTIA Bernh. Schrad. Journ. Bot. 1800^2 : 124. 1801.

Dennstaedtia punctilobula (Michx.) Moore, Index Fil. xcvii. 1857.

Nephrodium punctilobulum Michx. Fl. Bor. Am. 2 : 268. 1803.

Dicksonia punctiloba Hook. Sp. Fil. 1 : 79. 1846.

Dicksonia pilosiuscula Willd. Enum. Pl. Hort. Berol. 1076. 1809.

Nova Scotia and New Brunswick to Ontario and Minnesota, south to Georgia and Alabama.

Family VII. MARSILEACEAE R. Br. Prodr. Fl. Nov. Holl. 1 : 166. 1810.

MARSILEA L. Sp. Pl. 1099. 1753.

Marsilea quadrifolia L. Sp. Pl. 1099. 1753.

Apparently indigenous at Bantam Lake, Litchfield County, Connecticut (*Allen*), though possibly adventive from Europe. Extensively introduced.

Marsilea macropoda Engelm. Am. Journ. Sci. II. 3 : 56. 1847.

Texas and New Mexico.

Marsilea uncinata A. Br. Flora 22: 300. 1839.

Louisiana; Dallas, Texas (*Reverchon*).

Marsilea vestita Hook. & Grev. Icon. Fil. 2: *pl. 159*. 1831.

Marsilea mucronata A. Br. Am. Journ. Sci. II. 3 : 55. *text f. 2.* 1847.

Arkansas and Texas to California, north to Washington, British Columbia, Montana, and South Dakota. Also in Florida.

Marsilea tenuifolia Engelm.; Kunze, Am. Journ. Sci. II. 6: 89. 1848.

Pierdenales, Texas (*Lindheimer*); western Texas (*Wright*).

PILULARIA L. Sp. Pl. 1100. 1753.

Pilularia americana A. Br. Monatsb. Kön. Akad. Wiss. Berlin 1863: 435. 1863. PILLWORT.

Several localities in California. Also in Arkansas (*Nuttall*) and Oregon (*Leiberg*).

Family VIII. SALVINIACEAE Reichenb. Consp. 30. 1828.

SALVINIA Adans. Fam. Pl. 2: 15. 1763.

Salvinia natans (L.) Hoffm. Deutsch. Fl. 2: 1. 1795. SALVINIA.

Marsilea natans L. Sp. Pl. 1099. 1753.

Bois Brulé Bottoms, Perry County, Missouri (*Demetrio*); central New York (*Pursh*).

AZOLLA Lam. Encyc. 1: 343. 1783.

Azolla caroliniana Willd. Sp. Pl. **5**: 541. 1810.
New York to Florida, Arizona, California, and Oregon.

Azolla filiculoides Lam. Encyc. 1: 343. 1783.
California. Probably of wider range. Introduced at Springfield, Massachusetts (*A. A. Eaton*).

Family IX. EQUISETACEAE Michx. Fl. Bor. Am. **2**: 281. 1803.

EQUISETUM L. Sp. Pl. 1061. 1753.

Equisetum arvense L. Sp. Pl. 1061. 1753. COMMON HORSE-TAIL.
Virginia to California, north to Newfoundland and Alaska. Also in Greenland. Very variable, apparently presenting no stable subspecies.

Equisetum pratense Ehrh. Hannöv. Mag. **1784**: 138. 1784.
Nova Scotia to Alaska, south to New Jersey, Minnesota, Nebraska, and Colorado.

Equisetum telmateia Ehrh. Hannöv. Mag. **1783**: 287. 1783.
California to British Columbia.

Equisetum sylvaticum L. Sp. Pl. 1061. 1753. WOOD HORSE-TAIL.
Newfoundland and Labrador to Alaska, south to Virginia and Nebraska. Also in Greenland.

Equisetum palustre L. Sp. Pl. 1061. 1753. MARSH HORSE-TAIL.
Nova Scotia to Saskatchewan and Alaska, south to Maine, Connecticut, western New York, Illinois, Minnesota (?), and Washington.

Equisetum littorale Kühl.; Rupr. Beitr. Pflanzenk. Russ. Reich. **4**: 91. 1845. JOINT-GRASS.
Maine and Ontario to New Jersey and Pennsylvania, west to Minnesota (*Holzinger*).

Equisetum fluviatile L. Sp. Pl. 1062. 1753. SWAMP HORSE-TAIL. TOAD-PIPES. JOINT-GRASS.
Equisetum limosum L. Sp. Pl. 1062. 1753.
Nova Scotia to Alaska, south to Virginia, Kansas, and Washington.

Equisetum ramosissimum Desf. Fl. Atl. **2**: 398. 1800.
Vancouver Island, British Columbia (*Lyell*). Also in southern California (*Davidson*).

Equisetum mexicanum Milde, Verhandl. k.-k. zoolog.-bot. Gesell. **12**^{2}: 1256. 1862.
San Bernardino and Los Angeles counties, California.

Equisetum robustum A. Br. Am. Journ. Sci. **46**: 88. 1844.
New Jersey to Georgia and Louisiana, west to British Columbia and California.

Equisetum hyemale L. Sp. Pl. 1062. 1753. SCOURING-RUSH. PIPES. SHAVE-GRASS.
Quebec and New England to Virginia, Texas, California, Washington, and British Columbia.

Equisetum laevigatum A. Br. Am. Journ. Sci. **46**: 87. 1844. SMOOTH SCOURING-RUSH.
New Jersey to North Carolina and Louisiana, west to British Columbia, Oregon, California, and Texas.

Equisetum variegatum Schleich. Cat. Pl. Helvet. 27. 1807.

Arctic America, south to New Brunswick, New Hampshire, New York, Nebraska, and Nevada. Also in Greenland.

Equisetum scirpoides Michx. Fl. Bor. Am. **2**: 281. 1803.

Labrador to Alaska, south to New Brunswick, Massachusetts, Pennsylvania, Illinois, Nebraska, Montana, and British Columbia. Also in Greenland.

Family X. LYCOPODIACEAE Michx. Fl. Bor. Am. 2: 281. 1803.

LYCOPODIUM L. Sp. Pl. 1100. 1753.

Lycopodium selago L. Sp. Pl. 1102. 1753. FIR CLUB-MOSS.

Labrador to Alaska, south to Washington, Idaho, Michigan, northern New York, Vermont, Maine, and in the higher mountains to North Carolina. Also in Greenland.

Lycopodium porophilum Lloyd & Underw. Bull. Torr. Club **27**: 150. *pl. 2. f. 6–7.* 1900.

Wisconsin; Indiana; Kentucky; Alabama (*Peters; Underwood*).

Lycopodium lucidulum Michx. Fl. Bor. Am. **2**: 284. 1803. SWAMP EVERGREEN. SHINING CLUB-MOSS.

Newfoundland and Prince Edward Island to Ontario and Minnesota, south to South Carolina, Tennessee, and Missouri.

Lycopodium inundatum L. Sp. Pl. 1102. 1753. BOG CLUB-MOSS. CROW'S-FOOT.

Newfoundland, Prince Edward Island, and Nova Scotia to New Jersey, Pennsylvania, Illinois, Michigan, and Ontario. Also from Washington to Alaska.

Lycopodium inundatum bigelovii Tuckerm. Am. Journ. Sci. **45**: 47. 1843.

Cape Breton Island and Nova Scotia to Vermont, Rhode Island, and New Jersey.

Lycopodium chapmani Underw., nom. nov.

Lycopodium inundatum var. *appressum* Chapm. Bot. Gaz. **3**: 20. 1878. Not *Lycopodium selago* var. *appressum* Desv. Mém. Soc. Linn. Paris **6**: 180. 1827.

Lycopodium adpressum (Chapm.) Lloyd & Underw. Bull. Torr. Club **27**: 153. 1900.

Lycopodium inundatum var. *elongatum* Chapm. Bot. Gaz. **3**: 21. 1878. Not *Lycopodium elongatum* Sw. Syn. Fil. 175. 1806.

Massachusetts to Rhode Island and New York (Long Island), south to Florida, Alabama, and Louisiana. Coastal in its range.

Lycopodium pinnatum (Chapm.) Lloyd & Underw. Bull. Torr. Club **27**: 155. *pl. 3. f. 27–30. pl. 4* in part. 1900.

Lycopodium inundatum var. *pinnatum* Chapm. Fl. So. U. S. ed. 1. 600. 1860.

Lycopodium alopecuroides var. *pinnatum* Chapm. Fl. So. U. S. ed. 3. 638. 1897.

Florida and Georgia to Mississippi.

Lycopodium alopecuroides L. Sp. Pl. 1102. 1753.

Long Island, New York (*Clute*) to Florida, Alabama, and Mississippi. Mainly near the coast.

Lycopodium carolinianum L. Sp. Pl. 1104. 1753.

New Jersey to Florida and Mississippi.

Lycopodium annotinum L. Sp. Pl. 1103. 1753. STIFF CLUB-MOSS.

Newfoundland and Nova Scotia to Mackenzie and Alaska, south to Massachusetts, Pennsylvania, Michigan, Minnesota, Colorado, Idaho, and Washington. Also in Greenland. Includes the form known as var. *pungens*.

Lycopodium clavatum L. Sp. Pl. 1101. 1753. RUNNING PINE. STAG-HORN EVERGREEN.

Labrador and Newfoundland to Alaska, south to Oregon, Saskatchewan, Minnesota, Wisconsin, Michigan, Pennsylvania, and southern New England.

Lycopodium obscurum L. Sp. Pl. 1102. 1753. GROUND PINE. TREE CLUB-MOSS.

Lycopodium dendroideum Michx. Fl. Bor. Am. **2**: 282. 1803.

Newfoundland and Nova Scotia to North Carolina, Tennessee, Minnesota, and Montana. Also in Alaska.

Lycopodium cernuum L. Sp. Pl. 1103. 1753.

Florida, Alabama, and Mississippi; near the coast.

Lycopodium sitchense Rupr. Beitr. Pflanzenk. Russ. Reich. **3**: 30. 1845.

Labrador to northern New England, New York, and western Ontario. Also from Idaho and Oregon to Alaska.

Lycopodium sabinaefolium Willd. Sp. Pl. **5**: 20. 1810. GROUND FIR.

Prince Edward Island, northern New England, and Ontario.

Lycopodium chamaecyparissus A. Br. in Döll, Rhein. Fl. 36. 1843.

Maine to Georgia and Minnesota.

Lycopodium complanatum L. Sp. Pl. 1104. 1753.

Labrador and Cape Breton Island to British Columbia, south to Virginia, Indiana, Minnesota and Idaho.

Lycopodium alpinum L. Sp. Pl. 1104. 1753.

British Columbia to Alaska. Also in Greenland.

PSILOTUM Sw. Syn. Fil. 187. 1806.

Psilotum nudum (L.) Griseb. Abh. Kön. Gesell. Wiss. Göttingen **7**: 278. 1857.

Lycopodium nudum L. Sp. Pl. 1100. 1753.

Bluffton, South Carolina (*Mellichamp*); southern Florida.

Family XI. SELAGINELLACEAE Underw. Our Native Ferns ed. 1. 103. 1881.

SELAGINELLA Beauv. Prodr. Aetheog. 101. 1805.*

Selaginella selaginoides (L.) Link, Fil. Sp. Hort. Berol. 158. 1841.

Lycopodium selaginoides L. Sp. Pl. 1101. 1753.

Selaginella spinosa Beauv. Prodr. Aetheog. 112. 1805.

Labrador to New Hampshire, New York, Michigan, Saskatchewan, and Alaska. Also in Colorado and Greenland.

Selaginella rupestris (L.) Spring in Mart. Fl. Bras. 1^2: 118. 1840.

Lycopodium rupestre L. Sp. Pl. 1101. 1753.

New England and Ontario to Georgia, west to California, Idaho, and British Columbia.

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*A number of new species of the *rupestris* group have recently been described by Dr. G. Hieronymus, from western North America. (Hedwigia **39**: 290 *et seq.* 1900). Although several of these will probably prove valid, it has been thought best, on account of insufficient material, to exclude all from the list.

Selaginella rupestris fendleri Underw. Bull. Torr. Club **25**: 127. 1898.
New Mexico and Colorado.

Selaginella densa Rydberg, Mem. N. Y. Bot. Gard. **1**: 7. 1900.
Western Nebraska to Montana.

Selaginella bryoides (Nutt.) Underw. Our Native Ferns ed. 6. 138. 1900.
Lycopodium bryoides Nutt.; Baker, Handbook Fern Allies 35. 1887.
Selaginella cinerascens A. A. Eaton, Fern Bull. **7**: 33. 1899.
Southern California.

Selaginella watsoni Underw. Bull. Torr. Club **25**: 127. 1898.
High mountains of Utah, Nevada, and California.

Selaginella mutica D. C. Eaton in Underw. Bull. Torr. Club **25**: 128. 1898.
New Mexico, Arizona, and Colorado.

Selaginella tortipila A. Br. Ann. Sci. Nat. V. **3**: 271. 1865.
Macon County (*J. Donnell Smith*) and Broad River (*Rugel*), North Carolina; Caesars Head, South Carolina (*J. Donnell Smith*).

Selaginella struthioloides (Presl) Underw. Bull. Torr. Club **25**: 132. 1898.
Lycopodium struthioloides Presl, Rel. Haenk. **1**: 82. 1830.
Selaginella oregana D. C. Eaton in Brewer & Wats. Bot. Cal. **2**: 350. 1880.
Oregon and Washington.

Selaginella arenicola Underw. Bull. Torr. Club **25**: 541. 1898.
Selaginella arenaria Underw. Bull. Torr. Club **25**: 129. 1898, not Baker.
Florida and Texas.

Selaginella rupincola Underw. Bull. Torr. Club **25**: 129. 1898.
New Mexico and Arizona.

Selaginella bigelovii Underw. Bull. Torr. Club **25**: 130. 1898.
Southern California.

Selaginella douglassii (Hook. & Grev.) Spring, Mém. Acad. Brux. **24^1**: 92. 1850.
Lycopodium ovalifolium Hook. & Grev. Icon. Fil. **2**: *pl. 177*. 1831, not Desv.
Lycopodium douglassii Hook. & Grev. Bot. Misc. **2**: 396. 1832.
Northern California to British Columbia.

Selaginella apus (L.) Spring in Mart. Fl. Bras. **1^2**: 119. 1840.
Lycopodium apodum L. Sp. Pl. 1105. 1753.
Maine and Ontario to British Columbia, south to Florida, Alabama, Louisiana, and Texas.

Selaginella ludoviciana A. Br. Ann. Sci. Nat. IV. **13**: 58. 1860.
Louisiana (*Drummond*); Alabama (*Mohr*); Florida (*Curtiss*).

Selaginella lepidophylla (Hook. & Grev.) Spring, Mém. Acad. Brux. **24^1**: 72. 1850.
Lycopodium lepidophyllum Hook. & Grev. Bot. Misc. **3**: 106. 1832.
Texas to Arizona.

Selaginella pringlei Baker, Handbook Fern Allies 88. 1887.
Chenate Mountains, Texas (*Nealley*).

Selaginella pilifera A. Br. Ind. Sem. Hort. Berol. App. **1857**: 20. 1857.
Texas (*Wright*).

Family XII. ISOETACEAE Torr. Fl. State N. Y. **2**: 514. 1843.

ISOETES L. Sp. Pl. 1100. 1753. QUILLWORT.

Isoetes lacustris L. Sp. Pl. 1100. 1753.
Labrador to the Lake Superior region and New Jersey.

Isoetes paupercula (Engelm.) A. A. Eaton, comb. nov.
Isoetes lacustris var. *paupercula* Engelm. Trans. St. Louis Acad. Sci. **4**: 377. 1882.
Isoetes occidentalis Henderson, Bull. Torr. Club **27**: 358. 1900.
Colorado to California, Washington, and Idaho.

Isoetes heterospora A. A. Eaton, Fernwort Papers 8. 1900.
Jordan Pond, Mount Desert Island, Maine (*Rand*).

Isoetes riparia Engelm.; A. Br. Flora **29**: 178. 1846.
Along the banks of the Delaware River in the following localities: Near Philadelphia, Pennsylvania (*Zantzinger; Durand*)*; Camden, New Jersey (*Parker; D. C. Eaton*); Chester, Pennsylvania (*T. C. Palmer*); Wilmington, Delaware (*Commons; Canby*).

Isoetes tuckermani A. Br. in A. Gray, Manual ed. 5. 676. 1867.
Maine, New Hampshire, Massachusetts, and Connecticut.

Isoetes tuckermani borealis A. A. Eaton, Fernwort Papers 10. 1900.
Labrador (*Allen*); Epping, New Hampshire (*A. A. Eaton*); Mount Desert Island, Kennebago Lake (*Coville*), and Oldtown (*Harvey*), Maine.

Isoetes hieroglyphica A. A. Eaton, Fernwort Papers 10. 1900.†
Maine: St. Francis Lake; Moosehead Lake; Rangeley Lakes.

Isoetes harveyi A. A. Eaton, Fernwort Papers 11. 1900.
Oldtown and Mount Desert Island, Maine; Cambridge, Massachusetts (*Boott*).

Isoetes foveolata A. A. Eaton in Dodge, Ferns & Fern Allies New Eng. 38. 1896.
Epping, West Epping, East Kingston, and Newmarket, New Hampshire (*A. A. Eaton*); Meriden, Connecticut (*F. W. Hall*).

Isoetes saccharata Engelm. in A. Gray, Manual ed. 5. 676. 1867.
Banks of the Wicomico River, below Salisbury, and of the Nanticoke River, Maryland (*Canby*); Elk River, Maryland (*T. C. Palmer*); Four-Mile Run, near Washington, D. C. (*Steele*).

Isoetes saccharata reticulata A. A. Eaton in Steele, Proc. Biol. Soc. Wash. **14**: 49. 1901.
Hunting Creek, near Alexandria, Virginia (*Coville & Vasey; Maxon*).

Isoetes saccharata palmeri A. A. Eaton in Steele, Proc. Biol. Soc. Wash. **14**: 49. 1901.
Lloyds Creek, Maryland (*T. C. Palmer*); Mount Vernon, Virginia (*Coville*).

Isoetes melanospora Engelm. Trans. St. Louis Acad. Sci. **3**: 395. 1877.
Georgia: Stone Mountain, (*Canby; Underwood; Boynton*); Little Stone Mountain, Lithonia (*Small*).

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* Locality now apparently destroyed by improvements.—*A. A. Eaton.*

† The Robinson & Schrenk, Quiddy Viddy Lake, Newfoundland, specimens are probably to be referred here.—*A. A. Eaton.*

Isoetes echinospora braunii (Durieu) Engelm. in A. Gray, Manual ed. 5. 676. 1867.

Isoetes braunii Durieu, Bull. Soc. Bot. France **11**: 101. 1864.

Isoetes echinospora var. *boottii* Engelm. in A. Gray, Manual ed. 5. 676. 1867.

Labrador and Greenland to Alaska, southward to New England, New Jersey, Pennsylvania, Michigan, Utah, and southern Washington.

Isoetes echinospora robusta Engelm. Trans. St. Louis Acad. Sci. **4**: 380. 1882.

Isle La Motte in Lake Champlain (*Pringle*); Epping, New Hampshire (*A. A. Eaton*).

Isoetes echinospora muricata (Durieu) Engelm. in A. Gray, Manual ed. 5. 676. 1867.

Isoetes muricata Durieu, Bull. Soc. Bot. France **11**: 100. 1864.

Near the St. John at Madawaska, Maine (*Fernald*); Rockingham County, New Hampshire (*A. A. Eaton*); near Boston, Massachusetts; Lyme, Connecticut (*C. B. Graves*); Toms River, New Jersey (*Parker & Smith; Pollard*).

Isoetes bolanderi Engelm. in Parry, Am. Nat. **8**: 214. 1874.

Montana and Washington to western Colorado, Utah, and California.

Isoetes pygmaea Engelm. in Parry, Am. Nat. **8**: 214. 1874.

Mono Pass, California (*Bolander*).

Isoetes macounii A. A. Eaton, Fern Bull. **8**: 12. 1900.

Atka Island, Alaska (*Macoun*).

Isoetes maritima Underw. Bot. Gaz. **13**: 94. 1888.

Alberni, Vancouver Island, British Columbia (*Macoun*).

Isoetes canadensis (Engelm.) A. A. Eaton, comb. nov.

Isoetes riparia var. *canadensis* Engelm. Trans. St. Louis Acad. Sci. **4**: 383. 1882.

Isoetes dodgei A. A. Eaton, Fern Bull. **6**: 6. 1898.

Hastings County, Ontario (*Macoun*); East Wilton (*Fernald*), Cornish (*Chickering*), and Kennebunk, Maine; Uxbridge (*Robbins*), and Dedham (*Faxon*), Massachusetts; Brattleboro, Vermont (*Frost*); Kingston, New Hampshire (*A. A. Eaton*); Point Pleasant (*Best*), and Bethlehem, Pennsylvania.

Isoetes eatoni Dodge, Ferns & Fern Allies New Eng. 39. 1896.

Several localities in Rockingham County, New Hampshire. Also in Essex County, Massachusetts.

Isoetes gravesii A. A. Eaton, Fernwort Papers 14. 1900.

Connecticut: Goshen (*Underwood*); Lyme (*Graves*).

Isoetes engelmanni A. Br. Flora **29**: 178. 1846.

Maine to Delaware and Pennsylvania. Also in Illinois and Missouri.

Isoetes engelmanni caroliniana A. A. Eaton, Fern Bull. **8**: 60. 1900.

Several localities in North Carolina.

Isoetes engelmanni valida Engelm. in A. Gray, Manual ed. 5. 677. 1867.

Warriors Mark, Cornwall, and Smithville, Pennsylvania (*Porter*); Wilmington, Delaware (*Canby*); Salt Pond Mountain, Virginia (*Canby*); Great Falls, Maryland (*Ward*).

Isoetes engelmanni georgiana Engelm. Trans. St. Louis Acad. Sci. **4**: 384. 1882.

Georgia: Floyd County (*Canby*); Whitfield County (*Harper*).

Isoetes howelli Engelm. Trans. St. Louis Acad. Sci. **4**: 385. 1882.

Isoetes nuda Engelm. Trans. St. Louis Acad. Sci. **4**: 385. 1882.

Isoetes underwoodii Henderson, Bot. Gaz. **23**: 124. 1897.

Trinity and Calaveras counties, California; Dalles of the Columbia and Hood River, Oregon (*Howell*); Klickitat and Spokane counties, Washington (*Suksdorf*); Idaho (*Henderson*).

Isoetes flaccida Shuttlew.; A. Br. Flora **29**: 178. 1846.

Isoetes flaccida var. *chapmani* Engelm. Trans. St. Louis. Acad. Sci. **4**: 386. 1882.

Several localities in Florida.

Isoetes melanopoda J. Gay, Bull. Soc. Bot. France **11**: 102. 1864.

Several localities in Illinois. Clifton, Iowa (*Vasey*); Oklahoma (*Butler*); Exeter, Nebraska; Jackson County, Missouri.

Isoetes melanopoda pallida Engelm. Trans. St. Louis Acad. Sci. **4**: 387. 1882.

Texas: Dallas (*Reverchon*); Hempstead and Houston (*Hall*); Harrisburg (*Joor*); Columbia (*Bush*); Hockley (*Thurow*).

Isoetes butleri Engelm. Bot. Gaz. **3**: 1. 1878.

Missouri, Oklahoma, and Tennessee.

Isoetes butleri immaculata Engelm. Trans. St. Louis. Acad. Sci. **4**: 388. 1882.

Near Nashville, Tennessee (*Gattinger*); St. Louis, Missouri (*Eggert*).

Isoetes minima A. A. Eaton, Fern Bull. **6**: 30. 1898.

Near Waverly, Spokane County, Washington (*Suksdorf*).

Isoetes nuttallii A. Br. in Parry, Am. Nat. **8**: 215. 1874.

Isoetes suksdorfii Baker, Handbook Fern Allies 132. 1887.

Washington, Oregon, and Idaho; Vancouver Island, British Columbia (*Macoun*); Marin County, California (*Mrs. Brandegee*).

Isoetes orcuttii A. A. Eaton, Fern Bull. **8**: 13. 1900.

San Diego, California (*Orcutt*).

Addition to Bibliography on page 623.

1893. The Altitudinal Distribution of the Ferns of the Appalachian Mountain System. John K. Small in Bulletin of the Torrey Botanical Club **20**: 455–467.

A SYSTEMATIC ARRANGEMENT OF THE FAMILIES OF THE DIPTERA.

By D. W. Coquillett,
Custodian, Section of Diptera.

The first attempt at classifying the Diptera into higher groups than genera was made in the year 1802 by Latreille, who recognized and named twelve families, but did not classify these into higher groups. In 1805, however, in a later volume of the same work, he divided the Diptera into two primary groups, to which he applied the terms Section Première and Section Seconde. The latter is equivalent to the modern families Hippoboscidæ and Nycteribidæ. The first section he subdivided into Division Première (equivalent to the Nemocera of the present day) and Division Seconde.

In 1809 Latreille applied the term Proboscidea to his Section Première, and subdivided his Section Seconde into two groups, which he named Eproboscidea and Phthiromyiæ, equivalent to the modern families Hippoboscidæ and Nycteribidæ, respectively. In these three groups he arranged the sixteen families.

In 1825 Latreille reverted to his original classification, containing only two primary groups, and subdivided the first into the four following groups: Nemocera, which is the same as at present recognized under the same name; Tanystoma and Notacantha, which together are equivalent to the Orthorhapha Brachycera; and Athericera, equivalent to the Cyclorhapha with the exclusion of the Hippoboscidæ and Nycteribidæ.

Macquart, in 1834, recognized only two primary groups, the Nemocera of Latreille, and the Brachycera, which included all of the other Diptera. He employed the same classification in 1838.

Westwood, in 1840, adopted Latreille's classification of 1825, together with Macquart's name Brachycera, under which he placed the Notacantha, Tanystoma, and Athericera of Latreille.

Walker, in 1848, adopted the two primary divisions founded by Latreille in 1805, which he designated suborders.

Haliday, in 1851, also adopted these two divisions, and subdivided the first into three groups, the Nemocera of Latreille; Brachycera, equivalent to the same group of Macquart with the exclusion of the family Phoridæ; and the Hypocera, which contained the Phoridæ.

Loew, in 1862, adopted Macquart's classification, except that he separated from the Brachycera the families Hippoboscidæ and Nycteribidæ as a third primary group.

Brauer, in 1863, divided the Diptera into two primary groups, the Orthorhapha, which included the Nemocera, Tanystoma, and Notacantha of Latreille's classification of 1825, and the Cyclorhapha, comprising the Athericera of Latreille, together with the families Hippoboscidæ and Nycteribidæ.

Schiner, in 1864, adopted Brauer's two primary divisions, subdivided the first into two groups, the Nemocera of Latreille, and Brachycera of Macquart, which he thus limited to its present condition. The latter group he further subdivided into two groups, the Cyclocera, which contained the modern families Stratiomyidæ, Tabanidæ and a part of the Leptidæ; and the Orthocera. The Cyclorhapha he subdivided into two groups, the Proboscidea and Eproboscidea, the latter comprising the families Hippoboscidæ and Nycteribidæ. The Eproboscidea he also subdivided into two groups, the Hypocera, containing the family Phoridæ, and the Orthocera, a term which, curiously enough, he had already applied to a previous group in the Brachycera. The Orthocera he subdivided into the Oligoneura, which comprised the Muscoid Diptera; and the Polyneura, comprising the families Syrphidæ, Conopidæ, Pipunculidæ and Platypezidæ. The family Lonchopteridæ he could not locate in any of these groups.

Osten Sacken, in 1878, adopted Brauer's two divisions, except that he separated out the families Hippoboscidæ and Nycteribidæ as a third primary group.

Van der Wulp, in 1877, adopted Brauer's two divisions, but in 1896 he followed the classification proposed by Osten Sacken.

Williston, in 1896, also adopted Brauer's two primary groups.

In 1883 Brauer elaborated his previous classifications, divided the Orthorhapha into the Nemocera and Brachycera as limited by Schiner, subdivided the first into three tribes, the second containing the family Cecidomyidæ, the third tribe composed of two subfamilies of the Tipulidæ, the other subfamily, together with the remaining eight families, forming the first tribe. The Brachycera he also divided into three tribes, the first composed of the family Lonchopteridæ, which he placed between the families Tipulidæ and Stratiomyidæ, the third tribe formed of the families Empidæ and Dolichopodidæ. The Cyclorhapha he divided into two sections, the first of which was subdivided into two tribes, containing the Syrphidæ and Pipunculidæ in one, and the Phoridæ and Platypezidæ in the other; the second section also contained two tribes, the first divided into the Calyptrata as one group, the Acalyptrata and the family Conopidæ forming another; the second tribe comprised the families Hippoboscidæ and Nycteribidæ.

These various attempts at classifying the Diptera into natural groups have not yielded altogether satisfactory results. The impossibility of indicating natural relationship by a linear arrangement is, of course, well understood. The following arrangement, which is a modification of the systems of Latreille and Schiner, with suggestions of Osten Sacken and Williston, will, it is believed, serve to indicate the natural relationships of the various families in a clearer manner than any of those that have been thus far proposed:

Suborder Proboscidea Latreille.
Section Orthorhapha Brauer.
Subsection *Nemocera* Latreille.
Superfamily *Tipuloidea* Coquillett.
Families: 1 Tipulidæ, 2 Dixidæ, 3 Culicidæ, 4 Psychodidæ, 5 Stenoxenidæ, 6 Chironomidæ, 7 Cecidomyidæ, 8 Mycetophilidæ.
Superfamily *Bibionoidea* Coquillett.
Families: 9 Bibionidæ, 10 Simulidæ, 11 Orphnephilidæ, 12 Blepharoceridæ, 13 Rhyphidæ.
Subsection *Brachycera* Macquart.
Superfamily *Tabanoidea* Coquillett.
Families: 14 Leptidæ, 15 Stratiomyidæ, 16 Acanthomeridæ, 17 Tabanidæ, 18 Acroceridæ, 19 Nemestrinidæ.
Superfamily *Bombylioidea* Coquillett.
Families: 20 Apioceridæ, 21 Mydaidæ, 22 Bombylidæ.
Superfamily *Asiloidea* Coquillett.
Families: 23 Scenopinidæ, 24 Therevidæ, 25 Asilidæ, 26 Empidæ, 27 Dolichopodidæ.
Superfamily *Phoroidea* Coquillett.
Families: 28 Lonchopteridæ, 29 Phoridæ.
Section Cyclorhapha Brauer.
Superfamily *Syrphoidea* Coquillett.
Families: 30 Platypezidæ, 31 Pipunculidæ, 32 Syrphidæ, 33 Conopidæ.
Superfamily *Muscoidea* Coquillett.
Group *Calypteratae* Desvoidy.
Families: 34 Oestridæ, 35 Tachinidæ, 36 Dexidæ, 37 Sarcophagidæ, 38 Muscidæ, 39 Anthomyidæ.
Group *Acalypterae* Macquart.
Families: 40 Scatophagidæ, 41 Heteroneuridæ, 42 Helomyzidæ, 43 Phycodromidæ, 44 Sciomyzidæ, 45 Sapromyzidæ, 46 Lonchæidæ, 47 Ortalidæ, 48 Trypetidæ, 49 Micropezidæ, 50 Sepsidæ, 51 Psilidæ, 52 Diopsidæ, 53 Ephydridæ, 54 Oscinidæ, 55 Drosophilidæ, 56 Geomyzidæ, 57 Agromyzidæ, 58 Borboridæ.
Suborder Eproboscidea Latreille.
Families: 59 Hippoboscidæ, 60 Nycteribidæ.

The Eproboscidea differ in so many important particulars from the remaining families—such as the method of reproduction, manner of living, much tougher integument of the body, structure of the proboscis and of the antennæ—as to justify their separation into a group equivalent to all of the other Diptera. Between these two divisions there are no intermediate forms. This is the position first assigned them by Latreille, and in this he has been followed by Meigen, Westwood, Walker, Haliday, and Bigot, while Loew and Osten Sacken make them one of three primary groups.

In the present arrangement the Tipulidæ are placed first in the list, since they are evidently the lowest, most generalized of all the Diptera; their comparatively large size, elongated form, weak organization, numerous, many-branched veins, and long, many-jointed antennæ all tend to confirm this supposition. The Mycetophilidæ are placed at the opposite end of the first superfamily for the reason that in several forms the legs, and especially the antennæ, are comparatively short and robust, thus approaching the members of the second superfamily; thus the genera *Platyura* and *Hesperinus* approach very close to *Plecia*, in the Bibionidæ, which begins the second superfamily. The genus *Rhyphus* is closely related to *Rhachicerus*, in the Leptidæ, for which reason the Rhyphidæ are placed at the end of the second superfamily, while the Leptidæ begin the third. The latter, the Tabanoidea, are bristleless flies, further distinguished from the two following superfamilies by the greatly widened empodia; the genus *Pangonia*, in the Tabanidæ, with its unusually large calypteres, frequently elongated proboscis and reported habit of hovering over flowers, like a humming-bird, naturally connects with the genus *Eulonchus*, in the Acroceridæ; and the relation of the latter to the Nemestrinidæ is a rather close one. The members of the following superfamily, the Bombylioidea, are usually more or less bristly, and are essentially flower-visiting flies among which the habit of hovering over flowers is of rather frequent occurrence, while the singular course of the veins in the apical part of the wings of many serve still further to connect them with the Nemestrinidæ. The Asiloidea are usually provided with stout bristles and are almost without exception predaceous, the habit of hovering over flowers being unknown.

The family Lonchopteridæ is retained in the Orthorhapha, notwithstanding the fact that de Meijere, from a recent study of the early stages of *Lonchoptera lutea*, while admitting that the family is in many respects intermediate between the Orthorhapha and Cyclorhapha, concludes that it has slightly more relationship with the latter than with the former. In *Lonchoptera*, however, there are four posterior cells in each wing, while the Cyclorhapha never have more than three of these cells; in the Orthorhapha Brachycera and in the Nemocera with a discal cell the possession of more than three posterior cells is the rule rather than the exception. Moreover, the position of the antennal arista is apical in *Lonchoptera*, while in the Cyclorhapha it is with few exceptions dorsal, but in the Orthorhapha Brachycera its position is almost without exception apical. The presence of stout bristles likewise indicates a relationship to the Asiloid rather than with the Syrphoid forms. For these and other reasons that might be cited the relationship of the Lonchopteridæ is evidently with the Orthorhapha rather than with the Cyclorhapha.

The form of the head, with the stout, reclinate frontal bristles, as well as the apical position of the antennal arista and the bristly body of the Phoridae, indicate a rather close relationship with the preceding family; the agile movements of the Phoridae, their disinclination to take to their wings when disturbed, together with the presence of bristles, ally them with the Dolichopodidae rather than with the Syrphoid group, with which they have sometimes been associated. The venation of the Phoridae is difficult of interpretation, but there are evidently three posterior veins, which would indicate the presence of four posterior cells, and this would exclude this family from the Cyclorhapha and would naturally indicate still more clearly its relationship with the Lonchopteridae and the remaining families of the Orthorhapha Brachycera.

The Phoridae naturally lead to the usually bristly Platypezidae, which is accordingly placed at the beginning of the next superfamily, the Syrphoidea, which differs from the Muscoidea in the greater development of the anal cell, which is always present and usually much longer than the second basal; moreover, they are very seldom provided with macrochaetae, which so often occur in the latter group. The relationships existing between the families are so apparent as to need no further mention.

Girschner was the first to point out the fact that *Calliphora* and several other genera, which had hitherto been placed in the Muscidae, have a perpendicular row of bristles on the hypopleura, as in the Sarcophagidae, Dexidae, and Tachinidae, while *Musca* and several other genera, like the Anthomyidae, do not have them. Accordingly, Pandelle has very properly removed to the Sarcophagidae the genera with hypopleural bristles; thus the more robust forms with strong bristles are brought together, while the weaker ones with weak bristles are retained in the Muscidae, a far more natural arrangement than the one heretofore in use.

The introduction of superfamilies in the present arrangement is for the purpose of more nearly bringing the classification of the Diptera into harmony with that of the other departments of zoology. Among entomologists, Dr. Uhler appears to have been the first to employ them, and more recently they have also been used by Mr. Ashmead in his admirable classification of the Hymenoptera. The superfamilies

Tipuloidea and Bibionoidea correspond to Osten Sacken's recently proposed divisions, *Nemocera vera* and *Nemocera anomala*, respectively, while the Tabanoidea are equivalent to his *Eremochaeta*, with the addition of the families Acroceridae and Nemestrinidae.

Osten Sacken, to whom the science owes so much in bringing about a more rational arrangement of the Orthorhapha, has suggested the merging of the old families, Xylophagidae and Coenomyidae, with the Leptidae, a suggestion since put in operation by Dr. Williston; the three groups appear to be altogether too closely related with each other to be maintained as distinct families.

The recently proposed family, Eretmopteridae, of Kellogg, does not appear to be sufficiently distinct from the family Chironomidae to be maintained; it was founded on a degraded form related to the genus *Chasmatonotus* Loew, but apparently more closely related to the short-winged genus *Smittia* Holmgren, from Spitzbergen, both of which have been referred by their authors to the Chironomidae.

Pupipara is a later term for, and therefore a synonym of, Eproboscidea.

A COMPARISON OF THE OSTEOLOGY OF THE JERBOAS AND JUMPING MICE.

By Marcus W. Lyon Jr.,
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The forms considered in the present paper are those that have usually been classed, especially recently, as a family of rodents under the name *Dipodidæ*, as has been done by Mr. Thomas in his paper "On the Genera of Rodents." While there may be strong grounds for such a classification and for the association of the six genera, *Sminthus*, *Zapus*,[1] *Dipus*, *Alactaga*, *Platycercomys*, and *Euchoreutes*, of which the first two are each usually put in a separate subfamily; yet the limited material at hand is sufficient to show strong osteological affinities between *Zapus* and *Sminthus* which has not usually been recognized and which places them in contrast to the rest of the group.

The writer has had for comparison complete skeletons of *Zapus* and an Egyptian *Dipus* in the United States National Museum, two skeletons of different species of *Alactaga* in the American Museum of Natural History, kindly placed at his disposal by Dr. J. A. Allen, and several odd skulls of *Zapus*, *Dipus*, and *Alactaga*, as well as the skin and skull of the type of *Sminthus flavus* in the National Museum.

Zapus and *Dipus* represent pronounced types, and for that reason, and because of the more complete material available, are compared at some length.

The vertebral column, with the exception of the cervical region, is essentially the same in each genus; the neck is short and weak; the dorsal vertebræ (twelve) present no peculiarities; the lumbar vertebræ (seven), especially the posterior ones, are built on a heavy plan with largely developed neural and anteriorly directed transverse processes. Four vertebræ form the sacrum, which is of the same form in each, and like that of the *Muridæ*. The caudal series is much longer than all the preceding portions of the column taken together; *Zapus* has the greater number of vertebræ—about thirty-six (there is some variation in different skeletons)—and the skeleton of *Dipus* shows twenty-eight.

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[1] This genus has been separated into three subgenera by Mr. Preble, North American Fauna No. 15, and recently Mr. Gerrit S. Miller, jr., Preliminary List of New York Mammals, Bulletin New York State Museum, VI, 1899, pp. 275, 330–331, has raised the subgenus *Napaeozapus* to generic rank. It differs from true *Zapus* only in the absence of the minute upper premolars. Doubtless in time many of the subgenera in the other genera will be thus raised to generic rank.

The atlas is a large ring, essentially the same in each genus, but the second cervical or axis shows considerable differences in the two genera.

In *Zapus* it is well developed and entirely free from the remaining five distinct vertebræ behind, as well as from the axis in front.	In *Dipus* the axis and the four succeeding vertebræ are completely fused into one large compound "axis," with a large compound neural spine which shows no signs of segmentation. The fused centrum does show signs of segmentation, however.
In *Zapus* atlas and axis are entirely free and articulate in the usual manner.	In *Dipus* atlas and axis, free dorsally and laterally only, below they are fused into one piece.

The seventh cervical is free from the rest of the series in each case.

The pectoral arch presents a few differences.

In *Zapus* the clavicle is longer, slenderer, and uniformly curved, convex outwardly.	In *Dipus*, clavicle stouter and heavier and somewhat in the shape of an italic *f*.
Scapula with the vertebral border curving into the anterior border, a shape usually seen in the *Muridæ*. The supraspinous and infraspinous fossæ are about equal in size.	Scapula with an almost straight vertebral border, which does not slope gradually into the anterior border. The supraspinous is much smaller than the infraspinous fossa.

The anterior limbs present no noticeable differences aside from relative proportions.

The fore limb of *Zapus* is about one-half the hind limb, or about three-quarters of the dorso-lumbar series of vertebræ.	The fore limb of *Dipus* is about one-quarter the hind limb, or about two-thirds of the dorso-lumbar series of vertebræ.

The pelvis shows no differences.

The hind limbs show marked differences, both as regards relative size and the number of elements in them. The ratio of the lengths of the different segments of the limbs to the total length of the leg is practically the same in each, but—

Zapus has shorter legs, the dorso-lumbar series of vertebræ being about two-thirds the length of the hind limb.	*Dipus* has longer legs, the dorso-lumbar series of vertebræ being about one-third the total length of the limb.

The femur is similar in each, but *Zapus* has a triangular projection (third trochanter) on the upper outer side, which, commonly found in the *Muridæ*, is lacking in *Dipus*.

The tibia is essentially the same in each, though *Dipus* has a larger crest in front.

The fibula is slender, long and distinct above, as usual in the Myomorphs, but fuses firmly with the tibia below, a little above its middle in *Dipus* and about as far below the middle in *Zapus*.

The tarsus is composed of the same elements in each genus, but is differently arranged in each, as—

Zapus has the anterior nonarticular part of the astragalus rather elongated, thus pushing the navicular forward, so that the outer side is in contact with the cuboid.	*Dipus* has the corresponding part of the astragalus shortened, so that the navicular appears somewhat shut off from the cuboid.
In *Zapus* the internal cuneiform is not much elongated and ends in an articular surface for the first metatarsal.	In *Dipus* the internal cuneiform is disproportionately long and lies close against the second metatarsal, ending in a thinned extremity.

The metatarsal bones show striking differences.

In *Zapus* they are five in number, elongated and separate, the lateral ones being subequal, but decidedly shorter than the three central ones. Each metatarsal bears a digit. All the digits have three phalanges except the innermost, which bears but two as usual.	In *Dipus* there is but one long rounded bone, "cannon" bone, trifid at its distal extremity, where it presents three articulating surfaces for the three digits. It is to be regarded as a compound bone composed of three fused metatarsals.
The three middle digits have the relative proportions seen in *Dipus*, a slightly longer median one and two subequal lateral ones. The innermost or first digit, hallux, reaches only as far as the metatarso-phalangeal articulation of the middle toes, and the first phalanx of the outer or fifth toe reaches the same point.	The two lateral digits are subequal and but little shorter than the middle one. Each is composed of three phalanges. There is just a trace of metatarsal five, on the outer posterior part of the "cannon" bone.

The skulls, as a whole, show very little resemblance to one another, points of community being found in the maxillo-zygomatic region only. The skulls of the *Dipodidæ* (*Dipus*, *Alactaga*, *Platycercomys*, *Euchoreutes*, *Sminthus*, and *Zapus*) are characterized chiefly by the great development of the antorbital foramen, large and rounded and with a more or less separate canal for the transmission of the superior maxillary division of the trigeminal nerve. The malar consists of a more or less horizontal portion articulating with the squamosal posteriorly and with the maxilla anteriorly, and a large more or less vertical portion, the anterior edge of which is in contact with the maxilla, the posterior edge free and forming the anterior boundary of the orbit, while the superior end of the vertical part is in contact with the lachrymal. But these common characters present several important differences in the two genera.

In *Zapus* the skull has a decided murine aspect, long and slender, with an unexpanded brain-case, no mastoid bullæ, and the zygoma sloping downward and backward from the maxilla.	In *Dipus* the skull has no murine aspect whatever; it is broad and heavy, much expanded behind, with the mastoid bones inflated as large as the true bullæ and the outer border of the antorbital foramen standing out in wing-like projections and sloping downward and slightly forward.

The palatal and pterygoid regions are quite different in the two genera.

In *Zapus* the palate bones are much shortened posteriorly, the free edge concave and ending on a line with the last molar teeth. It shows exactly the same condition as is found in *Mus*.	In *Dipus* the palate is much more elongated and produced posteriorly to a considerable distance behind the last molars and ends in a blunted projecting spine.
The pterygoids have the usual forms and proportions seen in *Mus*.	The greater posterior length of the bony palate makes the pterygoids correspondingly shorter.
In *Zapus* the external pterygoid plate assumes a more horizontal position and longitudinal direction, as in *Mus*.	In *Dipus* the external pterygoid plate is more vertical and more transversely placed.
Between the external plate (a process of the alisphenoid) and the internal pterygoid plate (the true pterygoid bone) is a shallow fossa, entirely destitute of a floor and of the same form as is found in *Mus*.	Between the external and internal pterygoid plates is a deep and conspicuous fossa, running forward and being floored by the posterior lateral portions of the bony palate and having for its roof the alisphenoid. It is a fossa on the order of that seen in *Microtus*.

The tympanic bones are of similar form and position in each genus, triangular in outline and placed more transversely than longitudinally, as against the position in the *Muridæ*. They are each inflated to form bullæ, which are—

smaller in *Zapus*, not approaching the median line, with the apices free from the basisphenoid. The inner edges abut closely against the basioccipital, so that no vacuities are formed.	larger in *Dipus*, nearer the median line, and the apex of each is definitely fused to the basisphenoid. Between their inner edges and the basioccipital are large vacuities.
The mastoid portion of the periotic is not abnormally enlarged in *Zapus*, does not overcrowd any of the other bones, and has a form and position very similar to *Mus*.	The mastoid portion of the periotic is greatly inflated in *Dipus* and presents almost as much surface on the posterior part of the skull as the tympanic bulla does on the ventral surface. The two portions push inward to such an extent as to encroach upon the supraoccipital and render that bone correspondingly narrow. They swell out laterally and superiorly, so that a portion is seen above the tympanic and between a posterior process of the squamosal and the parietal and supraoccipital.
The squamosal in *Zapus* is a thin and expanded bone, with its antero-posterior	The squamosal in *Dipus* is a compact and much contracted bone, with its dorso-

diameter greater than its dorso-ventral, and is of the same type as is found in the *Muridæ*.	ventral diameter much greater than its antero-posterior. Its shape and position are difficult to describe, and are best seen in the figure.
The zygomatic process of the squamosal much expanded at its origin *curves* decidedly downward. This is in accordance with its higher origin from the bone.	The zygomatic process of the squamosal comes out almost horizontally, *sloping* a little downward. This is in accordance with its lower origin from the bone.

The zygomatic region shows several differences. That of *Dipus* is apparently an extreme type, between which and *Mus*, *Zapus* seems to be somewhat intermediate. In *Mus* and other murines, both roots of the zygomatic process of the maxilla (saying that there is an upper root above the antorbital foramen and a lower root below it) arise one directly above the other. This condition holds—

in *Zapus*, where the lower root arises just in front of the premolar and the upper root about on a line directly above. This condition causes the anterior part of the zygomatic arch to slope from above downward and backward.	but in *Dipus* the upper root comes off at a considerable distance posterior to a point directly above the lower root. This condition causes the anterior part of the zygomatic arch to slope downward and forward.
Zapus has an almost triangular malar, which fits into the obtuse angle in the zygomatic process of the maxilla. The lower posterior angle of the malar is attenuated into a slender process going backward to the squamosal.	*Dipus* has a biradiate malar, the vertical part of which is much expanded laterally and fits into a right angle in the maxilla. The horizontal part is slender and runs backward to meet the squamosal.
The antorbital foramen in *Zapus* is more nearly elliptical, the major axis of the ellipse inclining outward from above downward.	The antorbital foramen in *Dipus* is more nearly ovoid, and the long axis inclines slightly inward from above downward.

At the lower inner corner of this foramen is a separate canal for the transmission of the second division of the fifth nerve, formed by a thin plate of bone arising from the lower root of the zygomatic process and abutting against the outer surface of the maxilla.

In *Zapus* the line of contact of this thin plate with the maxilla is always evident, and very often the plate fails to meet the side of the maxilla.	In *Dipus* this plate is completely anchylosed and the line of fusion obliterated.
The wall of the orbito-temporal fossa in *Zapus* shows a condition such as is found in *Mus* and the *Muridæ* generally, with all the bones ossified and in close approximation to one another.	In *Dipus* the wall of this fossa shows quite a deficiency in ossification. The optic foramina are unusually large. Just behind the orbito-sphenoid is a large crescent-shaped vacuity bounded in front by the orbito-sphenoid and the orbital plate of the frontal; above and behind, by the squamosal; and below, by the alisphenoid.

The incisor teeth in both genera are short and curved backward after the manner of the *Muridæ*. Each tooth is traversed by a groove in its anterior face. Each genus has three upper molars on a side and as many below, with the enamel thrown into folds, which are more complex in *Zapus*. *Zapus* has a small upper premolar, but in the genus *Napaeozapus* this tooth is entirely wanting. The premolar is lacking in *Dipus*.

The lower jaw of *Zapus* is much deeper behind and has a well developed coronoid process almost equaling in size the condyloid process. The sigmoid notch is correspondingly deep and pronounced.	The lower jaw of *Dipus* is shallow behind and with the coronoid process scarcely at all developed, with a corresponding diminution of the sigmoid notch.
Scarcely any prominence can be seen in *Zapus* corresponding to the covering of the root of the lower incisor.	The cap covering the root of the lower incisor forms a prominent projection beneath the condyloid process in *Dipus*.
The angle of the lower jaw in *Zapus* is deepened, with the lower border turned inward, and is not perforated by a foramen.	The angle of the lower jaw in *Dipus* is shallow and perforated by a large foramen.

Alactaga very closely resembles *Dipus* and differs from *Zapus* in essentially the same points that *Dipus* does. Its chief differences from *Dipus* are the scarcely inflated mastoid bullæ and the incomplete foramen for the nerve at the lower inner angle of the autorbital foramen. The vertical part of the malar is not so greatly expanded laterally and the audital bullæ are less inflated. *Alactaga* has the "cannon" bone of *Dipus*, but on either side of it is a small non-functional toe, consisting of a metatarsal and a digit. The cervical vertebræ show a tendency toward consolidation, but not that complete fusion found in *Dipus*.

In *Alactaga* the incisors are ungrooved and are not recurved as in *Dipus*, but project more forward, presenting an appearance seen in the Hares. A small premolar is present. The molars have a more complex enamel pattern.

In nearly all these respects *Dipus* is seen to be a much more specialized type. Both *Dipus* and *Alactaga* share nearly everything in common, aside from greater specialization, and are placed in strong contrast to *Zapus*.

Euchoreutes[1] is an animal with the foot structure of *Alactaga* and a skull on the *Dipus-Alactaga* type, but appearing more slender and with greatly enlarged bullæ. In the structure of its zygomatic arch, as well as in its narrower proportions, it approaches slightly the type of skull seen in *Zapus* and *Sminthus*. "The zygoma is very weak and thin, and the vertical portion, which separates the optic from the antorbital formen, is also very thin and slopes from above downward posteriorly (as in *Zapus*, *Sminthus*, and the *Muridæ*), while in *Alactaga* the corresponding part of the zygoma is either vertical or anteriorly directed. * * * There is, as in *Dipus*, a separate canal at the base of the foramen for the exit of the nerve."[1]

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[1] From the description and figures, Sclater, Proc. Zool. Soc., London, 1890, pp. 610–613.

The skull of *Sminthus* very closely approaches that of *Zapus*, and it is hard to see how Alston, in his arrangement of the Rodents, could have considered it as an aberrant member of the family *Muridæ*, and *Zapus*, *Dipus*, etc., as forming the *Dipodidæ*.

The structure of the zygomatic arch and the shape of antorbital foramen is almost precisely the same as are these structures in *Zapus*. The latter has a slightly wider malar and the separate passage for the nerve is a little more marked. The palates are of the same style, but the posterior free edge has a median spine in *Sminthus*. The only really striking differences are in the teeth. The upper incisors of *Sminthus* are plain, and the molars (there is also a small premolar) do not have the enamel in the same pattern, but raised up into cusp-like prominences arranged in pairs. While no skeleton is available, a careful examination of the skin reveals the fact that the hind feet are of similar form to those of *Zapus*—at least with respect to freedom of metatarsals, number of digits and phalanges.

Pedetes has often been classed with the *Dipodidæ*, but recently[2] it has been shown to possess many hystricomorph affinities, and Thomas has placed it in that group of Rodents under the family *Pedetidæ*.

Dr. Coues, in Monographs of North American Rodentia, and Dr. Gill, in the Arrangement of the Families of Mammalia, put *Zapus* in a separate family from that of *Dipus* and *Alactaga*. It is inferred that *Sminthus* went to the *Muridæ*. It would be in strict accordance with the facts, however, to associate *Zapus* and *Sminthus* in one group, following Winge, as the family *Zapodidæ;* and *Dipus*, *Alactaga*, *Platycercomys*, and *Euchoreutes* in an equivalent group as the family *Dipodidæ*.

The only pronounced common feature of the two families is the structure of the zygomatic arch and antorbital foramen. They all present the rare condition of a lachrymo-malar articulation. The arch has the most murine shape in *Sminthus; Zapus* is a shade further away; *Euchoreutes* shows a condition further removed, but on a skull of otherwise *Dipus* structure; *Alactaga* is much further removed, and *Dipus* still more so from the murine form.

The variations from a murine type of skull are entirely correlated with variations from a murine type of metatarsus. The *Zapus-Sminthus* group with the most generalized skull has the most generalized foot with the free metatarsals. We pass from generalization to specialization by both the foot and the skull and teeth from *Alactaga* to *Dipus*. Similar observations hold good in the case of the cervical vertebræ.

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[1] Sclater, Proc. Zool. Soc., 1890, pp. 610–613.

[2] Thomas, Proc. Zool. Soc., 1896, pp. 1012–1028, and Parsons, Proc. Zool. Soc., 1898, pp. 858–890.

In summing up, the old family *Dipodidæ* is seen to be composed of two clearly defined though somewhat related families, of which *Zapus* is typical of the one and *Dipus* of the other. The antorbital foramen and its subdivision for the nerve and lachrymo-malar articulation are the only striking points of similarity between the two families, but otherwise the skulls are widely different and each homogeneous in its own family.

The *Zapodidæ* are at once recognized by the five separate metatarsals, free cervical vertebræ, and general murine aspect of the skull. It is composed of two easily separable subfamilies.

Zapodinæ, with the enamel of the molar teeth thrown into folds and the crowns presenting a generally smooth surface; upper incisors grooved; skull less murine; zygoma heavier and less oblique palate concave posteriorly. It contains the three genera, *Zapus*, *Napaeozapus*, and *Eozapus*.

Sminthinæ, with the enamel of the molar teeth in an entirely different pattern, and above folded in opposite loops so that there seems to be four cusp-like processes on each tooth; the upper incisors without grooves; and slenderer skull and zygoma. It contains the genus *Sminthus* and possibly the fossil genus *Eomys*, which is usually referred to this group.

The *Dipodidæ* are to be recognized by the fusion of the three middle metatarsals into a "cannon" bone, longer hind limbs, a tendency toward consolidation of the cervical vertebræ, as well as a totally different form of skull, much laterally expanded. It seems to be readily separable into the three following groups, of which the first two should take subfamily rank, the *Dipodinæ* in contrast to the third group containing *Euchoreutes*.

Dipus group with *Dipus* and its subgenera, hind foot with three digits; cervical vertebræ anchylosed; mastoid considerably inflated; upper incisors grooved; no small premolar; antorbital canal for nerve complete.

Alactaga group, with *Alactaga* and its subgenera, hind foot with more than three digits, but lateral ones much shortened; cervical vertebræ not completely fused; mastoids not much inflated; upper incisors without grooves; and a small premolar present above; antorbital canal for nerve not fully complete. *Platycercomys* without the small premolar probably belongs to this group.

Euchoreutinæ is at once told from the preceding by the posterior slope of the zygoma and more elongated skull and interorbital constriction; no root-cap for incisor on side of mandible; posterior palatine foramina very large; hind foot with five digits; upper incisors not grooved; upper premolar present.

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EXPLANATION OF PLATES.

All figures one and a half times natural size. The letters on the plates have the following significance:

Sq, squamosal.
m, mastoid.
So, supraoccipital.
C, calcaneum or os calcis.
A, astragalus.
N, navicular.
Cu, cuboid.
Ec, *Mc*, and *Ic*, external, middle, and internal cuneiform.

PLATE XXV.

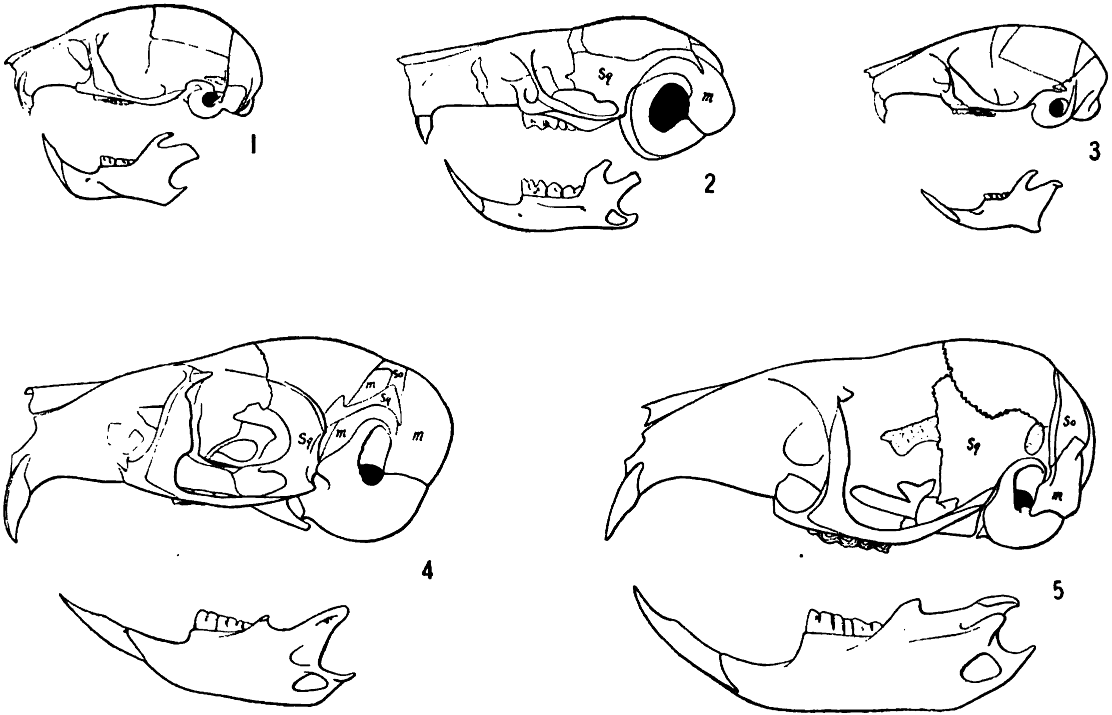
Fig. 1, lateral view of skull of *Zapus*.
2, lateral view of skull of *Euchoreutes*, redrawn to scale from Sclater's figures in Proc. Zool. Soc. Lond., 1890, p. 611. Compare with *Zapus* and *Sminthus* and note similarity of the zygomata.
3, lateral view of skull of *Sminthus*.
4, lateral view of skull of *Dipus*.
5, lateral view of skull of *Alactaga*.

PLATE XXVI.

Fig. 1, ventral view of skull of *Zapus*.
2, ventral view of skull of *Euchoreutes*, redrawn to scale from Sclater's figures in Proc. Zool. Soc. Lond., 1890, p. 611. Note the similarity of the ventral view with the same aspects of *Dipus* and *Alactaga*.
3, ventral view of skull of *Sminthus*.
4, ventral view of skull of *Dipus*.
5, ventral view of skull of *Alactaga*.

PLATE XXVII.

Fig. 1, left hind foot of *Zapus*, dorsal view and internal lateral view of the tarsal bones.
2, left hind foot of *Alactaga*, dorsal view and internal lateral view of the tarsal bones. The pre-tarsal part is drawn from a specimen in the American Museum of Natural History; the tarsal bones are filled in from a dissected tarsus taken from a skin in the U. S. National Museum.
3, left hind foot of *Dipus*, dorsal view and internal lateral view of the tarsal bones. Rudiment of the fifth metatarsal may be seen.



SKULLS OF ZAPUS, EUCHOREUTES, SMINTHUS, DIPUS, AND ALACTAGA.

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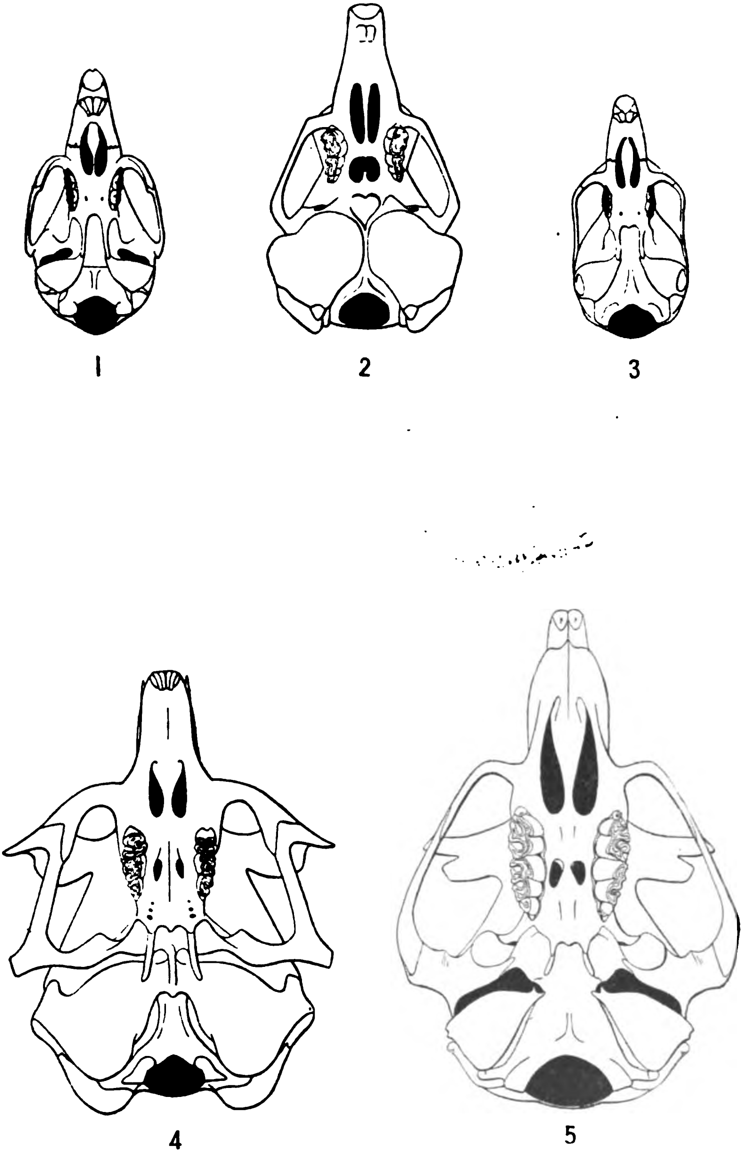

SKULLS OF ZAPUS, EUCHOREUTES, SMINTHUS, DIPUS, AND ALACTAGA.

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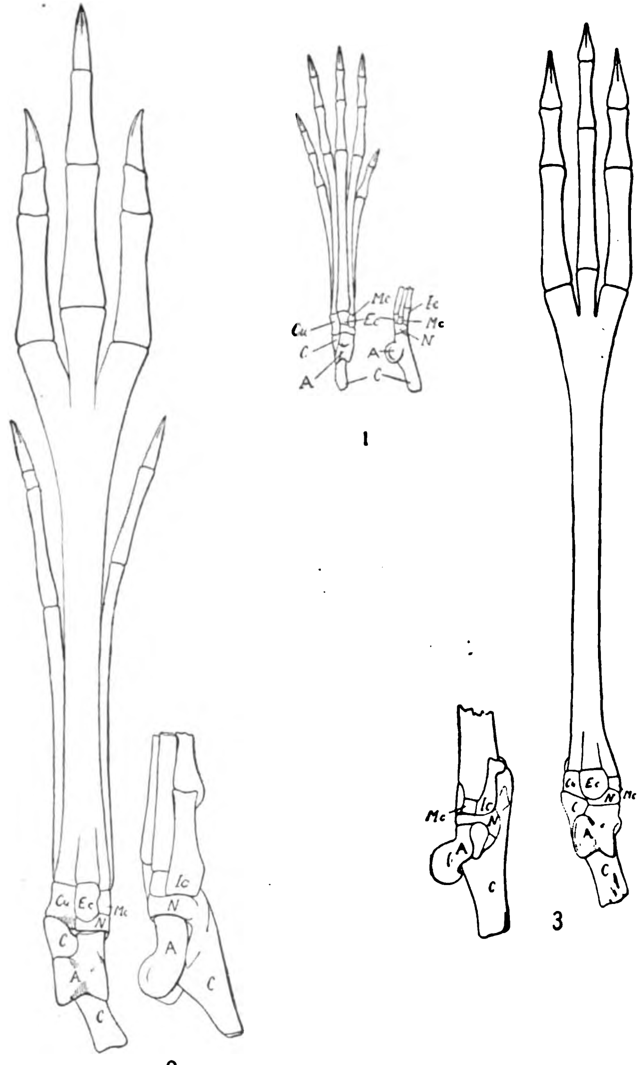

LEFT HIND FEET OF ZAPUS, ALACTAGA, AND DIPUS.

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CAMBRIAN BRACHIOPODA: OBOLELLA, SUBGÉNUS GLYPTIAS; BICIA; OBOLUS, SUBGENUS WESTONIA; WITH DESCRIPTIONS OF NEW SPECIES.

By CHARLES D. WALCOTT,
Honorary Curator, Division of Stratigraphic Paleontology.

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CAMBRIAN BRACHIOPODS OF SARDINIA.

In continuation of the study of the Cambrian Brachiopoda[1] the following notes have been assembled, which may be of service to students prior to the publication of a monograph on the subject:

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1889. *Obolella* WALCOTT, Proc. U. S. National Museum, XII, p. 36.
1892. *Obolella* HALL and CLARKE, Pal. New York, VIII, Pt. 1, pp. 66, 164.
1892. *Obolella* MATTHEW, Trans. Roy. Soc. Canada, IX, p. 39.
1894. *Obolella* HALL and CLARKE, Eleventh Annual Report New York State Geologist, p. 240, pl. III, figs. 5, 6, 7.
1896. *Obolella* MICKWITZ, Mém. Acad. Imp. Sci. St. Pétersbourg, VIII, p. 116.

Generic characters.—Shell subequivalve, moderately convex; dorsal valve more elevated at the umbo than the ventral; longitudinally ovate or oval in outline, with the dorsal valve sometimes transversely oval. Surface marked by concentric striæ of growth and radiating striæ, except in the subgenus *O.* (*Glyptias*) *favosa*, which has irregular transverse lines crossing the concentric striæ.

Shell substance unknown in an unaltered condition; it appears to have been calcareo-corneous, as in Obolus. Shell structure formed of a thin outer layer with many thin inner layers or lamellæ more or less oblique to the outer layer; the short lamellæ of the anterior portion of the valves are more oblique than the longer lamellæ of the central and posterior portions and lie on the edges in the same plane as the margins of the valves.

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[1] Note on the genus Lingulepis: Am. Jour. Sci., 4th ser., III, 1897, pp. 404, 405.

Cambrian Brachiopoda: genera Iphidea and Yorkia, with descriptions of new species of each, and of the genus Acrothele: Proc. U. S. Nat. Mus., XIX, 1897, pp. 707–718.

Note on the brachiopod fauna of the quartzitic pebbles of the Carboniferous conglomerates of the Narragansett Basin, Rhode Island: Am. Jour. Sci., 4th ser., VI, 1898, pp. 327, 328.

Cambrian Brachiopoda: Obolus and Lingulella, with description of new species: Proc. U. S. Nat. Mus., XXI, 1898, pp. 385–420.

Area of the ventral valve rises from the plane of the margins of the valve at angles varying from 10° to 70°; broadly subtriangular when the beak is projecting, otherwise rounded at the posterior margin almost as much as the area of the dorsal valve; the latter is usually on the plane of the margins of the valve and broadly rounded posteriorly; both areas are striated parallel to the base and divided midway differently in each valve and in an unusual manner; in the ventral valve a sharp, narrow pedicle slit cuts through the area from its base to the apex; this slit opens into a cylindro-conical chamber, varying in size and form, that terminates in the shell substance of the beak but does not penetrate to the surface of the shell; the striæ of the area pass into the slit and encircle the pedicle chamber; the latter is in form similar to the pedicle tube of the Siphonatretidæ, except that it is closed at the outer end, and the pedicle obtained egress through the narrow slit in the area; the area of the dorsal valve is divided by a narrow, raised, triangular space that is bordered on either side by a more or less deeply impressed groove formed by a narrow fold of the areal lamellæ; outside of this groove, and between it and the outer flexure fold of the area, occurs a depressed triangular space that has been considered by authors as the scar of the point of attachment of cardinal muscles. Sometimes the inner angle of the area of the ventral valve adjoining the pedicle slit projects forward so as to form a tooth-like knob, which in the cast is shown by a deep indentation beside the cast of the pedicle chamber and between the latter and the projecting cast of the undercut beneath the area.

Splanchnocœle[1] of the ventral valve confined to the posterior half, while in the dorsal valve it extends forward to and in some instances beyond the center; in both valves it extends back to the splanchnocœle part of the area, which is bounded by the flexure lines. Traces of a median septum are shown in the dorsal valve, but no definite septum has been observed in the ventral valve. A central median ridge of varying degree of size and length often extends toward the central portion of the dorsal valve; when it is large a deep, rounded groove usually occurs on each side of it, on the inner slope of which the central muscle scars may be situated. Often the median ridge is practically absent.

The grooves of the main vascular sinuses begin in each valve at the front margin of the area near the median line, and in the ventral valve gradually extend forward and outward toward the front half of the shell, where they begin to gently curve inward, terminating toward the front of the valve, the distance and curvature varying in different species. In the dorsal valve the main vascular sinuses curve out more rapidly, and are much less prominent; none of the secondary radial canals or the peripheral vascular sinuses have been observed. The course of the parietal scar between the main vascular sinuses is in front of the splanchnocœle in the ventral valve; also in the same valves it passes around the muscle scars between the main sinuses and the base of the area, in line with the flexure line of the area; in the dorsal valve it closely follows the outside limits of the muscle scars, but it has not been traced across the main vascular sinuses.

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[1] Using nomenclature of Mickwitz.

The size and position of the pedicle and umbonal muscle scars are unknown, but they are probably similar to those of Obolus. The central scars are placed a little distance each side of the median line in the dorsal valve. In the ventral valve they are not separable from the middle and outside laterals, which occur on each side of the front of the visceral area. The middle and outside laterals of the dorsal valve are blended and lie obliquely outward, before the transmedian scars. The transmedian scars are close to the base of the area in both valves, and lie in the line of the prolongation of the flexure line of the area. In number and relative position the muscle scars of Obolella are essentially the same as those of Obolus.

Observations.—The genus Obolella has been under discussion by authors for nearly forty years. In the original description Mr. Billings noted its resemblance to Obolus, but claimed that it is distinct on account of the difference in "the arrangement of the muscular impressions." Later (1876) he compared it again with Obolus, but having poor illustrations of both Obolus and Obolella he failed to discover the true position and relations of the muscle scars in either. It was not until after Mickwitz's memoir on Obolus appeared, and the collections of Obolella made during the summer of 1899 were studied, that any correct comparisons could be made. It then became evident that there is practically no difference in the arrangement of the muscle scars of the two genera, but that there are most essential differences in the areas of the ventral valve. Before working out the relations of the narrow pedicle slit of Obolella to the cylindro-conical pedicle chamber, I was at a loss to find generic differences of value, although I felt that the area of the dorsal valve of Obolella indicated differences not readily explained.

The pedicle passage of Obolus varies greatly in size and form, but it is always an open furrow. In Obolella it is in the ventral valve a cylindro-conical inner chamber opening through a narrow slit in the area of the ventral valve, the area rising from the plane of the margin of the valve; in the ventral valve a slightly raised area occupies the place of the broad furrow in Obolus.

Obolella is confined to the Olenellus or Lower Cambrian fauna. Obolus, as now limited, appears in the Middle Cambrian, but has its greatest development in the Upper Cambrian fauna. Of the subgenera *Obolus* (*Lingulella*) *schucherti* is found associated with Obolus (*O. crassa*) at Troy, New York.

Bicia gemma is associated with *Obolella crassa* both at Bic and Troy, and the species was referred to Obolella by Mr. Billings. It differs so radically from Obolella in the character of the areas of the valves and the interior markings that it is scarcely necessary to institute comparisons between them.

Obolella as known at present is limited to six species and one variety:

Obolella chromatica Billings.
Obolella atlantica Walcott.
Obolella crassa Hall.
Obolella crassa var. *elongata* Walcott.
Obolella favosa Linnarsson.
Obolella lindströmi Walcott.
Obolella mobergi Walcott.

Of the above two species *O. chromatica* and *O. atlantica* belong to the upper portion of the Olenellus fauna, and *O. crassa* and var. *elongata* to the lower portion. The three Swedish species *O. favosa*, *O. lindströmi*, and *O. mobergi* are from the basal Cambrian sandstones and may belong to the same horizon as *O. crassa*.

The species that have heretofore been referred to Obolella, in addition to those listed above, are now distributed in the following genera:

O ? ambigua	Walcott	=Elkania.
O. cingulata	Billings	=Kutorgina.
O. circe	Billings	=Billingsella.
O. coelata	Billings	=Acrothele.
O. desquamata	Billings	=Obolella crassa.
O. desiderata	Billings	=Elkania.
O. discoidea	Hall and Whitfield	=Obolus (Lingulella).
O. gemma	Billings	=Bicia.
O. gemmula	Matthew	=Obolus (Lingulella).
O. ida	Billings	=(?)
O. minuta	Hall and Whitfield	=Acrotreta.
O. misera	Billings	=Linnarssonia.
O. nana	Meek and Hayden	=Dicellomus.
O. nitida	Ford	=Linnarssonia (?).
O. pectenoides	Whitfield	=Dicellomus.
O. polita	Hall	=Dicellomus.
O. pretiosa	Billings	=Linnarssonia.
O. prima	Whitfield	=Obolus (Lingulepis).
O. transversa	Hartt	=Linnarssonia.

OBOLELLA MOBERGI, new species.

General form ovate, with the ventral valve subacuminate and the dorsal valve obtusely subacuminate; valves moderately convex. Beak of the ventral valve slightly elevated above the plane of the shell; beak of the dorsal valve curved down to the plane of the margin. Surface of the shell marked by concentric lines and striæ of growth, and in some examples by rather strong, radiating, broken, and slightly irregular raised lines. The elevated lines are of the same character as those on *Bicia gemma*. The shell is formed of a thin outer layer and numerous inner layers or lamellæ, the latter over the anterior half of the shell. These inner lamellæ are oblique to the outer layer and are arranged as imbricating layers, very much as in *O. favosa.*

A ventral valve 10 mm. in length has a width of 9 mm. A dorsal valve 9 mm. long has the same width.

The area of the ventral valve is of medium length and tipped back of the edge of the valve to meet the beak. It extends well out on to the cardinal slopes of the valve. It is divided midway by a narrow pedicle furrow that passes inward into a large cylindrical chamber, closed at its outer end. The surface of the area is marked by rather strong transverse striæ crossing the area and extending in and around the pedicle slit and chamber. On each side of the pedicle chamber there is a rather strong undercut which in the cast is replaced by a marked tooth-like projection. The area of the dorsal valve is narrow and, as far as can be determined from the single cast, very much like that of *O. crassa.*

The casts of the interior of the ventral valves show a central visceral area, very much like that in *O. crassa;* also two strongly marked vascular sinuses that extend well into the middle of the valve. No clearly defined muscle scars are shown on any of the specimens. Casts of the interior of the dorsal valve give little satisfactory data in relation to the muscle scars. The cast shows a part of the outline of the visceral area, also the impression of the transmedian muscle scar.

Observations.—This species appears to be the European representative of *O. crassa*, which occurs at the same relative stratigraphic horizon at Troy, New York. The Swedish species differs from the American in being slightly more elongate in outline and in having the interior thickenings of the area more strongly developed. The exterior surface also appears to be marked by stronger radiating lines. It differs from *O. atlantica* and *O. chromatica* in being a much more robust shell, and in many slight details. *O. pristinus* is more rotund and convex.

O. mobergi is associated with the Olenellus fauna in Sweden in the *Schmidtia torelli* zone.

Formation and locality.—Lower Cambrian. Zone of *Schmidtia torelli*, Bjorkelunda, south of Simrishamr, in a gray sandstone. Sularp, near Lund, Sweden, in a brown sandstone.

Received from Dr. Joh. Chr. Moberg.

OBOLELLA LINDSTRÖMI, new species.

This species differs from *Obolella mobergi* in the more subacuminate outline of the valves, the surface characters, and the interior of the dorsal valve. The surface of *O. lindströmi* is much like that of *Bicia gemma.*

The ventral valve occurs in a hard gray sandstone of the *Schmidtia torelli* zone, and the cast of the dorsal valve is from one of the brown sandstone spots that occur within the gray sandstone at Sularp. I am not sure that the dorsal valve illustrated actually belongs to this species, as it is not associated with the typical ventral valve.

It differs from the typical dorsal valves of *O. mobergi* in being more acuminate, and there is no corresponding ventral valve associated with it in the material studied.

I take pleasure in naming the species in honor of Dr. G. Lindström, to whom all paleontologists are deeply indebted for his many contributions to the paleontology of the Silurian formations of Scandinavia.

Formation and locality.—Lower Cambrian. Zone of *Schmidtia torelli*, Bjorkelunda, south of Simrishamr, in a gray sandstone. Sularp, near Lund, Sweden, in a brown sandstone.

GLYPTIAS, new subgenus.

The subgenus Glyptias is based on the peculiar surface sculpture and the very short area.

Type.—*Obolella* (*Glyptias*) *favosa* Linnarsson.

OBOLELLA (GLYPTIAS) FAVOSA Linnarsson.

Lingula (?) *favosa* LINNARSSON, Ofversigt af Kongl. Vetenskaps-Akad. Forhandlingar, No. 3. Om nagra försteningar fran Vestergötlands sandstenslager, p. 356, 1869. Also the English translation, published as a pamphlet, p. 16. Stockholm, 1869.

General form ovate, with the ventral valve subacuminate and the dorsal valve obtusely rounded; valves moderately convex. The dorsal valve is abruptly curved downward at the beak to the plane of the edge of the shell, while the beak of the ventral valve is slightly above the margin, the posterior edges of the shell curving up to meet it, and thus forming a passage for the pedicle out of a narrow pedicle slit. Surface of the shell marked by very fine concentric lines or striæ of growth, crossed transversely by undulating, slightly lamellose lines in almost identically the same manner as in *Obolus* (*Westonia*) *stoneanus* of the Upper Cambrian of Wisconsin. When the outer surface of the shell is exfoliated or worn off by attrition, which is the usual condition, the surface of the inner layers shows fine, radiating, and concentric striæ. The shell is formed of a very thin, highly ornamented outer layer and numerous inner layers or lamellæ; the latter over the anterior portions are oblique to the outer layer, and when the shell is partially exfoliated they appear as imbricating layers, very much as in *Obolus matinalis*.

The largest ventral valve in the collection has a length of 7 mm. and a width of 6 mm. An associated dorsal valve 6 mm. long has a width of 6.25 mm.

The area of the ventral valve is narrow and rises slightly to meet the beak, which is elevated above the posterior margin. The pedicle furrow or slit is short and narrow, and, judging from the appearance of the specimens, where the beak of the valve is broken away it opened into a pedicle chamber that was closed at the outer end as in *Obolella crassa* and other species of the genus. On the dorsal valve there is no evidence of a true area except in the presence of a narrow, thickened rim somewhat like that of the dorsal valve of *Bicia gemma*. None of the muscle scars are shown in the ventral valve. The position of the central and anterior lateral scars of the dorsal valve is indicated by the outline of the visceral cavity. Of the vascular markings the main sinuses are clearly shown in each valve, also the outline of the position of the parietal scar.

Observations.—This beautiful little shell has remained without illustration since Dr. Linnarsson gave it a name in 1869, based on the "singular sculpture" of the outer shell. In a collection made for me by M. Schmalensee, the collector of the Swedish Geological Survey, there were several specimens showing casts of the interior more or less imperfectly. From these I was able to ascertain that the shell had the generic characters of Obolella, although differing from the typical species of that genus in the character of the surface ornamentation. The outer surface has been seen only on the posterior umbonal portion of the valves in the shells collected for me by M. Schmalensee.

Formation and locality.—Lower Cambrian. Fucoid sandstone. Vestergotland, Bithingen, Sweden.

Genus BICIA, new genus.

Shell subequivalve, moderately convex; longitudinally ovate, with the ventral valve sometimes subacuminate and the dorsal valve subcircular. Beaks of both valves as now known terminate at the posterior margin. Surface marked by concentric and radiating striæ.

Shell substance unknown in an unaltered condition. Shell structure formed of a thin surface layer and numerous inner layers or lamellæ more or less oblique to the outer layer. Area of the ventral valve usually on the plane of the edges of the valve, but in some instances rising at a low angle; it is usually high, and triangular in outline, but the apex may be rounded and the base curved forward at the median line; divided midway by a narrow pedicle furrow and again at each side by a narrow flexure line that extends forward and outward from the apex. Area of dorsal valve short, appearing in both of the known species to rise from the plane of the edges of the valve. Striæ of growth subparallel to the base cross the areas.

The main vascular sinuses of the ventral valve are narrow and extend forward from the projecting center of the base of the area, gradually separating as they cross the visceral area and extending forward beyond the transverse center of the shell; in the dorsal valve they appear to separate more rapidly and to follow the outer margin of the ventral cavity except in the second species. A narrow median septum is indicated in the dorsal valve on the crest of a strong median ridge.

One of the striking features in both of the known species of this genus is the oblong oval boss that is present in the ventral valve of most adult shells. It is situated on each side of the forward projecting central portion of the area, with the larger axis extending forward and outward when the shell is subacuminate or transversely when the shell is broadly rounded. In the dorsal valve of *B. gemma* it is not so well defined as in *B. whiteavesi*. The boss is bounded by the margin of the base of the area, the narrow elongate sulcus containing the marginal muscle scars and the base of the main vascular sinuses. In *B. whiteavesi* it reached its greatest development in both valves, resembling in position and surface characters the posterior adductor scars of the Craniidæ. Somewhat similar bosses occur in the ventral valve of *Obolella crassa* and *Obolus apollinis*, but they are not developed to the extent they are in Bicia. They appear to occur only in those thick shells that have deposits of shell substance over the visceral area.

The outline of the parietal scar in the ventral valve incloses a heart-shaped visceral area in the ventral valve, closely circumscribing the muscle scars. Its general course in the dorsal valve is suggested by the position of the muscle scars.

Five pairs of muscle scars have been observed. The rather large central scars in the dorsal valve are placed close to the broad median ridge, a little back of the center; the small anterior laterals are slightly in advance of the centrals on the median ridge, close to the median line; the transmedian scars are almost under the edge of the area and near the outer margin; the outside and middle laterals are slightly in advance and further out than the transmedian scars; the centrals, middle laterals, and outside laterals of the ventral valve are grouped in the narrow space on each side of the U-shaped forward projecting portion of the visceral area. Traces of individual scars have been seen, but they can not be separated so as to identify them. The transmedian and anterior lateral scars are close to the outer margin of the valve and just in advance of the oblong boss in front and each side of the forward-projecting base of the area. Umbonal and pedicle scars unknown except what may possibly be a small umbonal scar in the dorsal valve of *B. whiteavesi*.

Type.—*Obolella gemma* Billings; second species, *Bicia whiteavesi* Walcott.

Observations.—Bicia is a form that combines many of the characteristics of Obolella and Obolus. It resembles Obolella in the arrangement of the muscle scars and main vascular sinuses of the interior of the valves. It differs in having a high area with an open pedicle groove in the ventral valve and an elevated ridge or boss in the back portion of the dorsal valve that in one species, *B. whiteavesi*, appear to have been the base of attachment of some portion of the muscular system. The ensemble of the dorsal valve of Bicia is unlike that of either Obolella or Obolus. Bicia, with its thick shell, high area, deep central cavity (heart-shaped cavity of Mickwitz), arrangement of visceral cavity, muscle scars, and vascular markings in the ventral valve, is a true Obolus of the *O. apollinis* type, but in its more elongate outline, strongly striated surface, and in nearly all details of the dorsal valve it is quite distinct.

Of the two species now referred to, the genus *B. gemma* has an unusually thick shell and a very marked deposit of shell substance over the visceral area in the ventral valve, the posterior portion of the same area in the dorsal valve, and along its median line. In the second species there is a considerable deposit over the same area with the exception of the median line, where the strong median ridge is absent.

BICIA GEMMA Billings sp.

Obolella gemma BILLINGS, Can. Nat., 1872, new ser., VI, p. 218, fig. 5, p. 217.

Obolella gemma WALCOTT, Bull. U. S. Geol. Sur., No. 30, 1886, p. 116, pl. x, figs. 2, 2a–e; Tenth Annual Report U. S. Geol. Sur., 1881, p. 612, pl. LXXI, figs. 5, 5a–c; pl. LXXII, figs. 2, 2a.

Obolella gemma HALL and CLARKE, Pal. N. Y., 1892, VIII, Pt. I, pl. II, figs. 42–44.

General form ovate, with ventral valve subacuminate when the beak is extended or obtusely acuminate when the beak is rounded; dorsal valve oval to subcircular in outline. The convexity of the valves is fairly strong and nearly the same in each where they are embedded in the same matrix.

Surface of shell marked by numerous slightly irregular concentric striæ and lines of growth; by fine radiating striæ between stronger radiating lines, and on some shells by undulations of strongly developed, elevated, radiating striæ; the radiating striæ are often slightly irregular and interrupted. When the outer surface is partially worn away it is smooth, or the shell has a peculiar surface formed by traces of the radiating undulations and striæ. The concentric striæ and lines of growth are shown on the outer surface of the inner layers of the shell and on the interior surface, where rather strong radiating striæ are often beautifully shown.

The shell is usually thick and strong for one so small; those from St. Simon and Troy appear to be calcareous and formed of one solid layer. This is probably owing to their condition of preservation, as in a weathered specimen lamellæ oblique to the outer surface are clearly shown, and indications of lamellæ on the central and posterior portions that point to the same shell structure as in Obolus and Obolella.

The ventral valves average about 5 mm. in length; the largest is

7 mm. Width, average, 4 mm.; largest, 5 mm. The dorsal valve is about one-fifth shorter than the ventral.

The area of the ventral valve is usually on the plane of the margins of the valve, but many specimens show it rising at angles varying from 1° to 10°. It is high and narrow, somewhat as in *Obolus* (*Lingulella*) *acuminatus* Mickwitz, and divided midway by a strong, rounded, narrow pedicle furrow; the striæ of growth are rather coarse and arch forward at the center and across the pedicle furrow, following the contour of the base of the area; the position of the flexure line is sometimes clearly shown by a narrow depression. The area of the dorsal valve is short and easily escapes observation except in well-preserved shells. It sometimes has a slight central pedicle depression, and often is only a short, almost smooth surface extending well out on the cardinal slopes of the valve.

The muscle scars, as far as determined, are arranged as in Obolus. The umbonal and pedicle scars have not been observed. The elongate oval central scars are rather large in the dorsal valve, and situated on each side of the strong median ridge about the middle of the valve; in the ventral valve they are crowded in with the scars of the middle and outside laterals; the anterior laterals are barely discernible in one specimen of the dorsal valve as small oval dots on the central ridge a short distance in advance of the centrals. In the ventral valve they are close to the base of the area and near the outer edge of the shell. The middle and outside laterals in the ventral valve are situated in the trapezoidal area, but do not appear to be separable on the specimens in the collection. In the dorsal valve they are well shown in advance of the transmedian scar. The latter in the ventral valve is merged with the anterior lateral.

Of the vascular markings the main sinuses of the ventral valve are about all that are clearly shown, although the position of the parietal scar is indicated in advance of the center of the shell. One of the most strongly marked characters of the dorsal valve is the median ridge; it varies in strength and outline in different shells, but is usually a prominent feature; it extends to the frontal margin in most shells, but in some it narrows and is less prominent anteriorly. A few specimens show a slight depression crossing it just in front of the central scars, and one has two minute anterior lateral muscle scars directly on the ridge, the parietal scar passing across just in front of them. The thickened shell beneath the visceral cavity of the ventral valve is present in nearly all adult shells; it varies greatly in size, form, and thickness; in some valves it covers the entire area within the parietal scar, and in others only a portion. The thickening in the dorsal valve is along the posterior border of the central cavity; this is best shown in the cast; the median ridge is also frequently more or less enlarged.

Formation and localities.—Lower Cambrian. Limestone conglomerates at Bic and St. Simon, on the St. Lawrence River, Province of Quebec, Canada. Also in Lower Cambrian limestones, both bedded and conglomerate, on the ridge east of Troy, New York, and 1 mile south of Schodack Landing, Rensselaer County, New York.

BICIA WHITEAVESI, new species.

This species is associated with *B. gemma* in a bedded limestone at Troy, New York. It differs from the latter in the dorsal valve by the absence of the median ridge, the presence of a broad area, and the presence in the interior of both valves of two large, circular, scar-like spots, one on each side of the median line and just in front of the area, that recall in appearance and position the posterior adductor scars of Crania. The ventral valve is so much like that of *B. gemma* that it is difficult to decide whether some shells should not be referred to *B. gemma.* There is a gradual transition, in form and character of the interior of the ventral valve, between the extremes represented in *B. gemma* and the extreme form of *B. whiteavesi.* If it had not been for the bosses of the dorsal valve associated with it I should have hesitated to refer it to a distinct species.

Formation and locality.—Lower Cambrian. Bedded limestone in siliceous shale on ridge in the eastern suburbs of Troy, New York.

OBOLUS, Additional notes on.

Observations.—Dr. Mickwitz[1] has given, in his exhaustive memoir on Obolus, a very complete historical sketch and full description of the genus and its subgenera so far as known to him. The material was so well preserved, and the study was conducted with such care and thoroughness, that our present knowledge of the adult shell of Obolus is as complete as that of the adult shell of the recent Lingula. In this note I shall present only such details as are essential to an understanding of the relations of (1) Obolus to Lingula; (2) Obolus to Obolella; (3) Obolus to its subgenera.

The student is referred to the memoir of Mickwitz for the literature, history, a geological sketch of the Cambrian formations of the eastern Baltic region of Russia, a minute description of the external and internal characters of the shells of Obolus, an exposition of the relations of Obolus to Lingula and Obolella, and detailed observations on Obolus and its subgenera as known to him.

Obolus and Lingula.—After studying the species from American rocks and a very good series from the typical localities in Russia, I am prepared to agree with Mickwitz that Obolus should be referred to the Lingulidæ, and that there is no good reason for establishing the family Obolidæ.

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[1] Über die Brachiopodengattung Obolus Eichwald: Mém. Acad. Imp. Sci. St. Pétersbourg, 8th ser., IV, No. 2.

Their points of similarity as described by Mickwitz are:

1. The chemical constitution and microscopic structure are the same.
2. The position of the umbonal muscle is the same in the dorsal valve.
3. The arrangement of the vessels of the circulatory system is the same in the two genera. Mickwitz says of this:[1]

> Issuing between the same muscle scars from the splanchnocœle, two main vessels extend in each valve into the fore part of the mantle lobes and branch inward and outward into numerous secondary vessels. The only difference in the arrangement of the vessels consists in this, that in Lingula the main vessels of the two valves empty into the peripheral canal, while in Obolus this takes place only in the large valve. In the small valve the main vessels, shortly before reaching the peripheral canals, bend into the interior of the valves and end at the scars of the anterior lateral muscles.

4. The general arrangement of the muscle scars is essentially the same, the points of difference being of a generic character.[1]

Their points of difference, according to Mickwitz, are:

1. In the area of the valves.
2. In Lingula the pedicle muscle is attached back of the scar of the umbonal muscle of the ventral valve, while in Obolus it is situated between the divided scar of the umbonal muscle of the ventral valve.
3. Quoting from Mickwitz:

> Besides the somewhat unlike arrangement of some scars, to which we shall presently return, the bipartition of certain muscles constitutes the most characteristic difference in the internal organization of the two genera. The umbonal muscle of Obolus, which is divided on the side of the large valve, while conversely the two transmedial muscles of Lingula, one of which is divided throughout its length, are represented in Obolus by a pair of undivided muscles.
>
> The position of the umbonal muscle is the same in the two genera; at most it is somewhat crowded away from the base of the area in Lingula, because of the pedicle muscle. On the contrary, the transmedial muscles, besides their bipartition, present other differences. In Obolus the scars of that part of muscles on the large valve are combined with those of the anterior lateral muscles, while in the corresponding shell of Lingula, though lying in a similar position, they are separated from the anterior lateral muscles. With the small valves the case is reversed. Obolus shows the scars of the pair of muscles in question isolated, while in Lingula they are united with those of the middle and outside lateral muscles.
>
> The scars of the two last-named muscles on the small valve of Obolus are combined in a manner analogous to those of Lingula, so that the whole difference in the arrangement of the scars in question (aside from the bipartition of one transmedial muscle in Lingula) consists in the reversal of their combination. In Obolus, on the large valve, the scars *i* and *j* are united, in Lingula they are separated; in Lingula, on the small valve, *i* and *k*, *l*, are united, while in Obolus they are separated.
>
> The scars of the anterior lateral muscles of the small valve have a closely similar position in the two genera, except that in Obolus they are moved farther forward, and are separated by the median ridge, while in Lingula they are nearer to the center of the valve and are united.

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[1] Über die Brachiopodengattung Obolus Eichwald, p. 121.

The other scars of the lateral muscles on the large valve of Obolus also are quite analogous in their position to the corresponding scars in Lingula. True, in their case, also small displacements and changes of form occur, but yet I am unable to attach to these any special value. The two genera show the scars of the outside lateral muscles combined with those of the central muscles, but we have seen that in some species of Eichwald's genus (*O. triangularis*, *O. panderi*, and some species of the subgenus Schmidtia), the first-named scars separate from those of the central muscles and change their subtriangular form, drawn out backward, into a rounded form, more like that in Lingula. The scars of the middle lateral muscles of the large valve, on the contrary, are only in Eichwald's genus combined with those of the central muscles, while in Lingula they are separated. It is probable, however, that some species of the above-named subgenus share this peculiarity with Lingula.

Finally, the scars of the central muscles of the two genera differ merely by their somewhat different form in the large valve, and by their somewhat different position with relation to the axis of symmetry on the small valve. It was pointed out, however, in speaking of the central muscles of Obolus, that the backward-protracted points of the subtrapezoidal scars in the large valve of the typical species (as well as those of the outside lateral muscles) are lacking in the species of the subgenus Schmidtia, so that even in regard to form there is an agreement with Lingula. In the small valve of Obolus the elliptic scars of the central muscles are parallel to the major axis of the valve or somewhat converging behind, while in Lingula they are strongly convergent anteriorly.

To the altered position of the muscle scars in Obolus corresponds the modified form of the parietal band. The latter in both valves of Lingula is rhombic, but in the smaller valve it is drawn farther forward than in the larger. In Obolus the parietal band on the small valve extends still farther toward the frontal edge than in Lingula, and in its posterior part is more markedly bent inward from both sides, producing a characteristic unequally three-lobed figure. The parietal band of the large valve of Obolus, on the contrary, is subelliptic in form, and rather approaches that of Lingula.

More important than this difference in form of the splanchnocœle is the difference in the form of the mantle lobes, which is manifest from the position of the posterior part of the parietal band. In Lingula the parietal band is moved away from the base of the area, and thus constitutes a narrow space between the two pleurocœles, which space is occupied by the mantle lobes that extend around the entire beak part of the valves. These mantle lobes of the beak are in the small valve also covered with mantle bristles, while the border of the mantle of the large valve, in the splanchnocœle part of the area (deltidium King) is free from bristles. In Obolus, on the contrary, the posterior part of the parietal band is close to the base of the splanchnocœle part of the area, whose lamellæ, as we have seen, are bent up at right angles to the plane of the valve, and therefore could not have been deposited by mantle lobes resting against the valves. Hence the mantle lobes of Obolus extended only as far as the pleurocœles, and were lacking, as well as the mantle bristles, in the splanchnocœle part of the area of both valves. At that point there was only the muscular wall of the body connecting the two valves, from which the pedicle emerged.[1]

Obolus and Obolella.—Authors have compared Obolella with Obolus, and Mickwitz thought that they might possibly be congeneric.[2] The narrow pedicle slit in the area of the ventral valve of Obolella opening into a cylindro-conical chamber is so unlike the pedicle furrow of Obolus that a distinct generic reference is necessitated by its discovery, despite the great similarity of the two genera in other respects. Except for the pedicle slit and chamber, the species of Obolella could not well be taken from Obolus.

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[1] Über die Brachiopodengattung Obolus Eichwald, pp. 118–121. [2] Idem, p. 129.

OBOLUS AND ITS SUBGENERA.

Lingulella Salter. I have been at times almost doubtful of the advisability of characterizing Lingulella even as a subgenus of Obolus. This distinction is now based on the more elongate form of most of the species of Lingulella and the greater thickness of the shell of the typical forms of Obolus.

Type.—Obolus (*Lingulella*) *davisii.*

Lingulepis Hall is an elongate, acuminate form of Lingulella, thus departing most widely in form from Obolus.

Type.—Obolus (*Lingulepis*) *acuminatus.*

Lingulobolus Matthew is a Lingulella-like form, with a very thick shell.

Type.—Obolus (*Lingulobolus*) *affinis.*

Schmidtia Volborth is a Lingulella-like shell without radial striation. All the species are small, and as the concentric striæ are very fine the shell surface is nearly smooth.

Type.—Obolus (*Schmidtia*) *celatus.*

Westonia Walcott is a Lingulella-like form distinguished by peculiar, transverse, semiimbricating, "ripple-embossed" lines that cross both the concentric and radiating striæ.

Type.—Obolus (*Westonia*) *aurora.*

Thysanotos Mickwitz. An Obolus with strong, uniformly curved concentric striæ, with lamellæ of growth fringed along their anterior (external) edges.

Type.—Obolus (*Thysanotus*) *siluricus* Eichwald.

Acritis Volborth. Concentric lines elevated, irregular, undulating. Valves strongly arched, massive. Visceral area (splanchnocœle) small and short; pedicle furrow conical and deeply impressed in area.

Type.—Obolus (*Acritis*) *antiquissimus* Eichwald.

Leptembolon Mickwitz. This subgenus is rather difficult to characterize. Mickwitz says of it:

> The subgenus Leptembolon is based on a species of Obolus which externally resembles Lingula very closely, and in fact was by earlier authors[1] regarded as such. The specimens of the internal surfaces of the valves, however, showed, together with some suggestions of the last-mentioned genus (Lingula), unmistakable marks of the genus Obolus, so that the species, which could not be assigned to any of the other groups, had to be ranked in a special subgenus of Eichwald's genus."[2]

Type.—Obolus (*Leptembolon*) *lingulæformis* Mickwitz.

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[1] Schmidt, Fr., Revision der silurischen ostbaltischen Trilobiten, Pt. I, p. 17.

[2] Über die Brachiopodengattung Obolus Eichwald, p. 199.

OBOLUS (?) MENEGHINI, new species.

Lingula petalon BORNEMANN, Nova Acta der Kais. Leop.-Carol. Deutsch. Acad. Naturf., LVI, p. 438, pl. XIX, figs. 12–14. 1891.

Obolella (?) sp. BORNEMANN, Nova Acta der Kais. Leop.-Carol. Deutsch. Acad. Naturf., LVI, p. 440, pl. XIX, fig. 18.

Rounded triangular frontal margin at times almost straight. Shells rather flat, their arching being greatest in the middle. Concentric and rather coarse lines of growth. Size, 5–11 mm.

Occurrence: In yellow, friable sandstone of Punta Pintau (Canalgrande) and of Gruguetta, Sardinia.

The specimen referred to Obolella (?) sp. is from the slate of Porto Canalgrande. It is not an Obolella, and may be identical with the species from the sandstones.

The shells referred to *Lingula petalon* suggest Obolus in form and surface ornamentation and are tentatively referred to that genus.

OBOLUS TETONENSIS, new species.

The general form, convexity, and appearance of this species is so much like that of *Obolus matinalis* that a full description is unnecessary. It varies from that species in the shorter, more transverse dorsal valve, and the narrower outline of the ventral valve toward the beak.

This species occurs in great abundance in the thin bedded limestone in the upper portion of the Cambrian section of the Teton Range, Wyoming, in association with *Billingsella pepina* and *Obolus* (*Lingulepis*) *acuminatus* var. *meeki*. What appears to be the same species occurs nearly 700 feet lower in the section in a thin bedded sandstone. The dorsal valve is broader and more transverse posteriorly than the dorsal valve from the upper horizon.

Formation and locality.—Middle Cambrian, on the divide at the head of Sheep Creek, near north end of the Teton Range, Wyoming. Thin bedded limestones, Belt Park, 6 miles out from Neihart, Montana. Three miles southeast of Malad City, Idaho. A smaller form collected by Dr. A. C. Peale in Bostwick Canyon, Bridger Range, Montana, may belong to this species. It occurs in a fine-grained sandstone low down in the Paleozoic section.

OBOLUS (?) ZOPPI, new species.

Obolella crassa BORNEMANN, Nova Acta der Kais. Leop.-Carol. Deutsch. Acad. Naturf., 1891, LVI, p. 439, pl. XIX, figs. 15–17.

Broadly oval or circular, with somewhat pointed vertex. Shells strongly arched, one somewhat more than the other. They are marked with prominent concentric lines; no radial striation is noticed. Found in a red-yellow sandstone layer not far from the houses of Canalgrande, Sardinia, on the road to Punta Pintau.

In view of the imperfect state of preservation, a determination can be based only on the outer form, whose habit agrees with the American species from the Cambrian limestone of Troy.

Dr. Bornemann kindly sent me two specimens of this form. They suggest *Obolella crassa* in form and outline, but the material is too imperfect to enable me to identify the species or genus. I find in one specimen indications of the presence of a high area that rises slightly above the plane of the ventral valve. In two there is nothing to suggest the foramen, which is usually well preserved in the ventral valve of species of *Obolella atlantica.* As the material is probably from the Middle Cambrian, a provisional reference is made to Obolus.

Subgenus LINGULELLA.

OBOLUS (LINGULELLA) BELLUS Walcott.

Obolus (*Lingulella*) *bellus* WALCOTT, Proc. U. S. Nat. Museum, 1898, XXI, p. 397.

Lingulella concinna MATTHEW, Bull. Nat. Hist. Soc., New Brunswick, 1900, IV, p. 273, pl. v, figs. 2a–b.

Lingula ? lens MATTHEW, Bull. Nat. Hist. Soc., New Brunswick, 1900, p. 274, pl. v, figs. 3a–b.

General form ovate, with ventral valve obtusely acuminate; dorsal valve broad ovate; valves moderately convex, so far as can be determined from the somewhat compressed specimens as they occur in the sandy shales.

Surface of shell bearing numerous concentric lines of growth, with exceedingly fine, slightly irregular striæ on the interspaces between the stronger concentric lines that form a surface somewhat like that of *O.* (*L.*) *ella.* Owing to the roughened surface formed by the fine striæ, the outer layer of the shell adheres to the arenaceous matrix, leaving the shiny inner layer on the shell. This is marked by concentric and numerous fine radiating striæ.

The shell is apparently thin, and is formed of a very thin outer layer, with one or more thin inner layers or lamellæ. The casts of the interior surface of the ventral valves show numerous papillæ arranged in concentric lines on the posterior half of the shell. These correspond to the punctæ of the inner surface.

A large ventral valve has a length of 15 mm.; width 9 mm.; and a dorsal valve 13 mm. in length has a width of 10 mm. The specimens in the collection average from 2 to 3 mm. smaller than those measured.

The cast of the area of the ventral valve shows that it was rather long and extended well out on to the cardinal slope; it is divided midway by a strong pedicle furrow, and toward the lateral margin by a narrow flexure line. The area is marked by fine striæ of growth parallel to the margin. The area of the dorsal valve is rather short, but it extends laterally well out on the cardinal slopes. The shallow curve corresponding to the pedicle groove of the larger valve is wide and clearly defined.

The casts of the interior of the valves show almost no traces of the vascular markings or muscle scars. Only the anterior lateral muscle scars have been observed in the ventral valve.

Observations.—This fine species occurs in great abundance in the upper beds of Little Bell Island, associated with *O.* (*L.*) *bellulus*, and also in the higher beds on Great Bell Island, a little below the layers carrying *Lingulobolus affinis* and *L. spissus.* Although found at some little distance above the horizon in which I collected a species of *Olenus*, I refer the horizon to the Upper Cambrian.

This species appears to be clearly distinct from any yet described. It may be compared with *O.* (*L.*) *davisi* in relation to its size and outline, but not in other respects. *O.* (*L.*) *lepis* ranges from the Lingula flags into the Tremadoc.

This is one of the most abundant forms in the shales and interbedded sandy layers of Cape Breton Island. Mr. Matthew described a compressed dorsal valve occurring in shale as *Lingulella concinna*, and some fragmentary shells occurring in limestone as *Lingula ? lens.* With his two types before me in comparison with a large series collected by Mr. S. Ward Loper at the same or near-by localities, I find that the two species merge into one and that they are identical with *O.* (*L.*) *bellus* as it occurs in Newfoundland.

The diagrammatic figures of *O.* (*L.*) *lens* as given by Mr. Matthew are misleading. The material from which his description was written and figures drawn is badly crushed and broken, the fragments of shells being embedded together in the limestone. None of the specimens show the apex of the ventral valve. The one used in illustration by Mr. Matthew has the apex broken away, and the shell is somewhat compressed laterally. The diagrammatic drawing of the dorsal valve is also inaccurate. His illustrations of the outer surface appear to be based on specimens from which the true outer surface has been exfoliated.

Among the collections made by Mr. Loper there are a large number of shells crushed and crowded together, very much as is the typical material used by Mr. Matthew. There are, however, in the accompanying shales large numbers of individual specimens that are beautifully preserved, which illustrate the outline and convexity of the shell. The series illustrates the growth of the shell, also the various forms in which it occurs owing to differences in the sediment in which it has been embedded. The material collected by Mr. Loper came from several horizons of the Upper Cambrian. Mr. Matthew assigns *Lingulella concinna* to the Dictyonema zone and *Lingula lens* to the Parabolena zone of the Cape Breton section.

Formation and locality.—Upper Cambrian. Arenaceous shales of the upper beds on Little Belle Island and Great Belle Island, Conception Bay, Newfoundland.

Several localities on McNeils Brook, 1 mile east of Marion Bridge, especially about the mill pond. Ravine one-half mile north of McMullin's, on crossroad to Boisdale railroad station. In ravine east of railroad, just south of Barachois post-office. Upper Leitches Creek, Cape Breton, Nova Scotia.

OBOLUS (LINGULELLA) BORNEMANNI, new species.

Lingula attenuata BORNEMANN, Nova Acta der Kais. Leop.-Carol. Deutsch. Acad. Naturf., 1891, LVI, p. 437, pl. XIX, figs. 1–10.

Form an oblong oval, sharply pointed toward the beak, marked with concentric, fine stripes, mostly regular, often also with large irregular concentric folds. Faint radial or longitudinal striation usually appears distinctly on the middle of the surface. At the vertex there is mostly a distinct straight longitudinal impression.

Shape greatly variable, often unsymmetric; short-rounded-triangular or almost circular, or narrower and elongated; more or less arched, or even flat. The long-extended specimens resemble *L. acuminata* Conrad. Others agree perfectly with Murchison's original figures. Others, again, may be compared with *L. davisii*, and were at first placed with that species. The simultaneous occurrence in enormous multitudes and the numerous transition stages leave no doubt that all those forms belong to one species, and the middle type of them fits best to *L. attenuata* Sowerby. Size, 2 to 9 mm.

Occurrence.—Very common in the Cambrian strata of Canalgrande, in yellowish-brown slates not far from the buildings of Canalgrande, in white-gray quartz sandstone in the valley of Gutturu Sartu, in yellow sandstones with Archæocyathus of Punta Pintau and elsewhere in Sardinia.

The state of preservation is best in the slates, yet there the specimens are mostly pressed flat. The specimens, existing in great numbers in the sandstones, often still exhibit their original arching, but the delicate shells are ordinarily distorted in an irregular manner and ill preserved.

The above notes are taken from a rather literal translation of the original description.

Dr. Bornemann identified this species with *Lingula attenuata* Sowerby, on account of the resemblance in outline of many of the specimens. Other specimens closely resemble *O.* (*L.*) *acuminatus* Conrad, from the Middle and Upper Cambrian of North America. It is so improbable that a species of this character should persist from Middle Cambrian time to Middle Ordovician time that, notwithstanding the resemblance, I think it is better to distinguish it from *L. attenuata* Sowerby, and give a specific name that will not lead to erroneous stratigraphic correlations. The Cambrian fauna of Sardinia is so distinct from that of other localities and the stratigraphic succession of the subfauna is so confused I think it unwise to identify its species with described species unless the material is so full and well preserved that there can be no doubt of their specific identity.

OBOLUS (LINGULELLA?) BICENSIS, new species.

Shell small, general form of ventral valve broad ovate, with the greatest width at the anterior third, from which there is a slightly curved, quite uniform slope to the beak. Moderately convex. Length of the one specimen known, 3 mm. Surface marked by fine, concentric striæ and very slight undulations of growth; also fine radiating striæ. The shell appears to have been thin, and formed of several very thin lamellæ, and marked on the interior by fine punctæ.

Observations.—This small species is known only by one specimen and its matrix that I found in a limestone bowlder of the conglomerate at Bic. It is associated with fragments of Olenellus and Agraulos. In form the ventral valve recalls *Dicellomus politus.* It is probable that if a number of specimens were obtained it would not be found to differ from typical forms of Obolus and its subgenus Lingulella.

Formation and locality.—Bowlder containing Lower Cambrian fossils, Bic conglomerate, eastern point of Bic Harbor, Province of Quebec, Canada.

OBOLUS (LINGULELLA) LINNARSSONI, new species.

Ventral valve elongate oval, subacuminate. Surface marked by fine, undulating, depressed, radiating, ridge-like lines; closely undulating, concentric striæ; and very fine papillæ that appear to terminate in fine, sharp points; the papillæ are situated on the narrow, irregular, elevated spaces between the striæ. Shell relatively thin and formed of several lamellæ more or less oblique to the outer surface.

Observations.—This species is based on a fine specimen of a ventral valve associated with *Orthis lindströmi* in the Paradoxides series of Lovened. It is broader than *O.* (*L.*) *ferrugineus*, and the surface ornamentation is quite different. The latter is more like that of the associated *Acrothele coriacea.* In outline it approaches more nearly to *O.* (*L.*) *lepis.*

Formation and locality.—Middle Cambrian. Lovened, Westrogothia, Sweden.

OBOLUS (LINGULELLA) RANDOMENSIS, new species.

General form elongate ovate; ventral valve rather broadly subacuminate, and dorsal valve slightly acuminate. The widest portion of the valves is the anterior third, from which they very gradually narrow toward the cardinal slopes. The convexity of the valves is moderate and uniform and nearly the same in each. Surface of the shell marked by fine concentric striæ and rather strong lines of growth, also fine radiating striæ. The shell is formed of a few thin lamellæ or layers, as far as can be determined from the fragments preserved on the casts in the sandstone. The longest ventral valve in the collection has a length of 10 mm., with a maximum width of 6 mm. The dorsal valve is slightly shorter.

As shown by the interior cast, the area of the ventral valve is rather long, and extends well forward on the cardinal slopes. It is divided at the center by a narrow pedicle furrow and midway by a very slight flexure line. The base of the area curves backward over the margin, arching slightly forward before reaching a rather deep indentation at the center. The striæ of growth cross the area parallel to its base. They are very sharp and fine and quite uniformly distributed over the area. Area of the dorsal valve unknown.

Observations.—This pretty species occurs in great numbers in thin layers of brown sandstone embedded in a dark shale a short distance below the Olenus zone. In form it resembles *Obolus* (*Lingulella*) *mosia* var. *osceola*. It differs from it in having a narrower pedicle furrow, and, upon comparison of a large number of specimens, in being slightly more elongate. It is narrower proportionately toward the beak.

Formation and locality.—Upper Cambrian, north side of Random Island, between Birch and Sandy Points, Smith Sound, Trinity Bay, Newfoundland.

OBOLUS (LINGULELLA) SCHUCHERTI, new species.

General form elongate ovate, ventral valve subacuminate and dorsal valve elongate ovate in outline. Surface marked by fine concentric striæ and rather strong concentric undulations or lines of growth; also fine radiating striæ, and on some specimens indistinct, rather narrow radiating depressed furrows.

The outer surface of the inner layers shows radiating striæ and concentric lines of growth. The radiating striæ are also present on the inner surface outside of the area of the vascular cavity.

The shell is formed of a thin outer layer and several thin inner layers or lamellæ arranged very much as in other thin shells of the subgenus Lingulella. The largest ventral valve has a length of about 11 mm.; width, 7 mm. A dorsal valve 8 mm. in length has a width of 5½ mm.

Casts of the interior of the ventral valve show a well-marked area, with a broad, strong pedicle furrow. The base of the area arches strongly forward. At the center across the pedicle furrow it has a slight backward arch just at the center. None of the specimens show the flexure line or the extent of the area along the cardinal slopes of the valve. The area of the dorsal valve is unknown. None of the characters of the visceral cavity or vascular markings are shown with sufficient clearness to permit me to describe them. A tubercle on each side of the median line, just in advance of the area, indicates the main vascular sinus, and a depression marks the position of the anterior portion of the visceral cavity.

Observations.—This is probably the oldest species of the subgenus Lingulella. It is associated with *Acrothele cœlata*, *Olenellus asaphoides*, and other characteristic species of the Lower Cambrian fauna. In its elongate dorsal valve it recalls *Obolus rhea* of the Middle Cambrian. It differs from that species in the character of the shell and the outline of the valve.

The specific name is given in honor of Mr. Charles Schuchert, who collected the only specimen of the species known to me.

Formation and locality.—Lower Cambrian conglomerate and bedded limestone, Troy, New York.

OBOLUS (LINGULELLA) SIEMIRADZKII, new species.

Lingula sp. cf. *exunguis* Eichwald, Siemiradzki, Jahrb. K. K. Geol. Reichsanst., 1886, XXXVI, p. 672.

Lingula cf. *exunguis* Eichwald, Gurich, Neues Jahrb. Min. Geol. Pal. 1892, I, p. 69; Verhandl. (Zapiski) Russ. Kais. Min. Gesell., St. Petersburg, 2d ser. 1896, XXXII, pp. 17, 214.

Attention was called to this species by Dr. Jos. Siemiradzki in 1886 in connection with his study of the Paleozoic rocks of the Middle Mountains of Poland. He speaks of it as *Lingula* sp. in the Black conglomerate, comparing it with *L. exunguis* Eichwald.[1] In the associated gray sandstone he found an Obolus "identical" with *O. siluricus* Eich.

Dr. G. Gurich wrote on the Paleozoic of the Middle Mountains (Mittelgebirge) in 1896, and, in a discussion of the Cambrian of Sandomir, mentions Siemiradzki's discovery of fossils in the lower sandstones and shales.[2]

Dr. Gurich added greatly to the fauna found by Dr. Siemiradzki. He mentions Paradoxides resembling *P. tessina*, *P. bohemicus*, *Agnostus fallax* Linnæus, *A. gibbus* Linnæus, *Liostracus linnarssoni* and refers the fauna to the Middle Cambrian. The "Lingula" he compared with *Lingula crassa* Eichwald, calling attention to the resemblance in the surface characters, also to those of *Lingulella davisii* Salter.

This is a small shell belonging to the group of species containing *O.* (*L.*) *ferrugineus*, *O.* (*L.*) *desideratus*, etc. The outer surface is marked by concentric, slightly undulating and imbricating striæ of growth, and the outer surface of the inner layers by fine, radiating striæ.

Through the kindness of Dr. F. Schmidt, I received a fragment of gray quartzitic sandstone containing a large number of specimens of the "Lingula" of Siemiradzki. The shell proves to be a true Lingulella. In the same piece of rock an obscure form of Obolus occurs that may be a medium-sized *Obolus apollinis*. I take pleasure in naming the Lingulella after its discoverer, Dr. Siemiradzki.

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[1] Jahrb. K. K. Geol. Reichsanst, XXXVI, 1886, p. 672.

[2] Neues Jahrb. Min. Geol. Pal., I, 1892, p. 69; Verhandl. (Zapiski) Russ. Kais. Min. Gesell., St. Petersburg, 2d ser., XXXII, 1896, p. 17.

Formation and locality.—Middle Cambrian. Quartzitic sandstone. Pepper Mountains, near Sandomir on the Vistula, Russian Poland.

OBOLUS (LINGULELLA) WINONA var. CONVEXUS.

A small, relatively convex shell occurs abundantly in the brown sandstones at Osceola Mills, Wisconsin, that appears to be an intermediate form between *O.* (*L.*) *winona* and *O.* (*L.*) *mosia*. It differs from *O.* (*L.*) *mosia* in being a shorter shell, and from *O.* (*L.*) *winona* in the more regularly ovate to semicircular dorsal valve and more acuminate ventral valve.

Observations.—The group of shells represented by *O.* (*L.*) *winona*, *mosia*, and their varieties appear to range from the Middle Cambrian beds of Hudson up and into the Upper Cambrian beds of Osceola Mills, etc. There is so much variety of form, owing to the different conditions of preservation, that it is very difficult to always be sure of the correctness of the specific reference. The variety *convexus* may be only the uncompressed form of *O.* (*L.*) *winona*, which is usually flattened in the shaly sandstones, or it may be a distinct species that from the material available for comparison can not be clearly determined.

Formation and locality.—Upper Cambrian. St. Croix sandstone, Osceola Mills, Menomonee, Prairie du Sac, Wisconsin. Middle Cambrian, Hudson, and Trempealeau, Wisconsin.

WESTONIA, new subgenus of OBOLUS.

Ovate, with ventral valve slightly acuminate; area of ventral valve strongly defined and divided by a relatively large pedicle groove. Surface marked by concentric and radiating striæ that are crossed by transverse, semiimbricating, "ripple-embossed" lines. As far as known the muscle scars and vascular markings are essentially the same as in Obolus.

Eight species are referred to Westonia—*Obolus* (*W.*) *aurora*, *O.* (*W.*) *stoneanus*, *O.* (*W.*) *rogersi*, *O.* (*W.?*) *lamellosus* Barr, *O.* (*W.*) *escasoni* Matthew, *O.* (*W.*) *ella*, *O.* (*W.*) *euglyphus*, and *O.* (*W.*) *chuarensis*. They all have transverse, irregular, elevated lines; that in *O.* (*W.*) *stoneanus* and *O.* (*W.*) *rogersi* have two or three sharp undulations near the median line and in *O.* (*W.*) *aurora* many short and more or less irregular undulations on the entire central portion of the shell. Beyond the short, central undulations, more or less wavelike, long undulations extend to the sides of the valve, usually with a slight backward curvature toward the margin.

OBOLUS (LINGULEPIS) GREGWA **Matthew.**

Lingulella gregwa MATTHEW, Bull. Nat. Hist. Soc., New Brunswick, 1899, IV, p. 199, pl. I, figs. 1a–f.

Lingulella tumida MATTHEW, Bull. Nat. Hist. Soc., New Brunswick, 1899, p. 200, pl. I, figs. 2a–c.

Leptobolus atavus MATTHEW, Bull. Nat. Hist. Soc., New Brunswick, 1899, p. 200, pl. II, figs. 1a–f.

General form elongate ovate, with the ventral valve acuminate and dorsal valve ovate-triangular in outline. The outlines of the valves vary, as shown by a series of specimens. The convexity of the valves varies with the condition of preservation. Those from the sandstone are rather strongly convex, while in the shale they are very much compressed. On the dorsal valve of most young shells there is a marked and rather broad, shallow sinus extending from the umbo to the front, where it flattens out. One of the largest ventral valves has a length of 21 mm., with a width of 18 mm. A dorsal valve 16 mm. in width has the same length; other examples are a little wider than long. Surface of the shell marked by concentric striæ and undulations of growth, over which there is a series of very fine, elevated, sharply undulating and inosculating lines that form a minute, irregular network over the surface, very much like that of *O.* (*Lingulella*) *ella*. Where the lines are strongly elevated the effect is that of a minutely granulose surface. When the thin outer layer of the shell is exfoliated the surfaces of the various inner layers is minutely granulose in addition to the flattened, radiating striæ and concentric lines of growth. The interior surface of both valves is often marked by concentric rows of strong pits or punctæ, very much as in *O.* (*Lingulella*) *davisi*. In some specimens the lines of punctæ extend over the surface of the visceral cavity so as to obscure the vascular markings and muscle scars. In some examples only a few scattered punctæ occur, while in others they are present over nearly the entire surface. The small shells are thin, but the larger ones are built up of a very thin outer layer and several inner layers or lamellæ that are more or less oblique to the outer surface, especially over the anterior and lateral portions of the shell.

The plane of the cardinal area of the ventral valve is nearly coincident near its edges with the edge of the shell. The area is long and extends well forward on the cardinal slope. It is divided midway by a narrow, rounded, deep pedicle furrow, and about halfway between the pedicle furrow and the lateral margins by an unusually well-defined flexure line which is in line with the main vascular furrows of the interior of the valves; fine striæ of growth cross the area and arch around the pedicle furrow parallel to the base of the area. There is practically no undercut beneath the area except near the flexure line at the frontal margin of the area. The area of the dorsal valve is short, narrow, and crossed by fine lines of growth parallel to its base.

The cast of the visceral cavity in the ventral valve shows it to have been relatively small and usually confined to the posterior half of the shell, although when the shell is laterally compressed it may be drawn out to the center of the valve, as in the specimen illustrated by Dr. G. F. Matthew. There are no traces of a median septum in the ventral valve; in the dorsal valve a slightly elevated median line occurs at the bottom of the groove between the central muscle scars, that extends forward to the anterior margin of the visceral cavity beyond the anterior lateral muscle scars. The visceral cavity of the ventral valve extends forward to about the center; in some shells it is back of the center, and in others a little in front. It varies in width and outline very much as the shells vary, being wide in broad shells and narrow in elongate forms.

The markings left on the shell by the vascular system are very strong, and beautifully preserved in some portions. In some shells there is a double groove with a slight ridge between; in others the ridge is large, only a trace of an outer groove remaining; in some young shells the grove is broad and shallow; in all shells the large size of the main vessels is shown by the broad, strong grooves or ridges left on the shell. It frequently happens that the deeply indented lines of pits on the lines of growth deeply indent the grooves and rounded ridges left by the main vessels and mark them off into sections. The interior and lateral vessels left narrow but strong grooves or ridges on the shell, which, however, are usually obscured by the strong pitting of the surface. The parietal scar surrounds the visceral cavity in each valve, crosses the course of the main vascular vessels, and comes back around the spaces occupied by the muscle scars, terminating at the edge of the area at the flexure in the ventral valve; termination unknown on the dorsal valve.

Some of the muscle scars are finely shown in the dorsal valve and fairly well in the ventral. The umbonal scar of the ventral valve is divided, the pedicle scar being situated between the two parts. In the dorsal valve the umbonal scar is close to the area and extends nearly as far each side of the median line as the length of the area.

The scars of the central muscles in the ventral valve are crowded in with the middle and outside laterals within the trapezoidal space. In the dorsal valve they are located on a low ridge each side of a central, longitudinal median depression; they are elongate oval in outline, their major axis being subparallel to the median line of the shell; fine longitudinal lines cross the scars in the best preserved specimens; the ridge on which the central scars occur varies in strength, but it appears to be present in all adult shells; it narrows gradually posteriorly and rather rapidly to the inner side of the anterior lateral muscle scars. The anterior laterals of the ventral valve are placed well back on the narrow space between the edge of the area and the main vascular sinus; they are elongate and rather large; in the dorsal valve they are elongate, with the major axis inclining forward toward the median line. The middle and outside laterals are situated in the trapezoidal area of the ventral valve, but neither is clearly separable from the other or from the central scars. In the dorsal valve the position of the middle and outside laterals is shown, but not their form or size. The transmedian scars in the ventral valve are seen just back of the anterior laterals, but they have not been observed in the dorsal valve, owing to the imperfections of the shell.

Observations.—This appears to be a representative of *O.* (*L.*) *acuminatus*, which is so abundant in the Middle Cambrian of the Upper Mississippi Valley and the passage beds between the Cambrian and Ordovician adjoining the Adirondack Mountains of New York. It differs from that species in its greater average width and in its surface characters.

Mr. Matthew's illustrations are diagrammatic and drawn from compressed, imperfect material. With a large series of well-preserved specimens I find that the species does not depart materially from the typical *O.* (*Lingulepis*) *acuminatus*. Mr. Matthew referred the species to a pre-Cambrian fauna, but in collections made by Mr. S. Ward Loper it occurs on slabs of siliceous shale and sandstone associated with heads and fragments of Paradoxides.

Lingulella tumida Matthew is founded on a longitudinally compressed and distorted ventral valve of this species. A number of such in various stages of transition between the two forms occur in the U. S. National Museum collections.

Leptobolus atavus Matthew appears to be founded on the young of *O.* (*L.*) *gregwa*. There is a transition in form between the types of *Leptobolus atavus* and the undoubted forms of *O.* (*L.*) *gregwa*.

This is one of the most interesting species I have seen. By its coarsely pitted inner surface it recalls *O.* (*Lingulella*) *davisi* of England, and *O.* (*Lingulella*) *willisi* of the southern Appalachians. The elongate ventral valve is like that of *O.* (*Lingulepis*) *acuminatus*, while the interior scars and markings are those of Obolus.

Formation and locality.—Middle Cambrian. Paradoxides beds. Siliceous shale and thin-bedded sandstones west side of McLean Brook, above Marion bridge road, Salmon River, Gillis Hill, 13 miles south of Marion bridge, Cape Breton Island, Nova Scotia.

Subgenus ACRITIS.

OBOLUS (ACRITIS ?) RUGATUS, new species.

The concentric surface lines which are the characteristic feature of this shell are of the same type as those of *O.* (*Acritis*) *antiquissimus*, although much coarser, and are prominent on the postero-lateral margins in much the same manner. It is a very rare form, only one specimen having been collected, although the beds in which it occurs were very thoroughly searched during the survey of the Eureka mine district.

Formation and locality.—Upper portion of the Middle Cambrian shaly limestone in Secret Canyon shale, Secret Canyon, Eureka District, Nevada.

CAMBRIAN BRACHIOPODS OF SARDINIA.

Dr. J. G. Bornemann has illustrated several species of brachiopods that occur in association with Cambrian types of trilobites. He identifies most of them with well-known Ordovician species of Europe. The most abundant is a species that is identified as *Lingula attenuata* of Sowerby, which occurs in the middle and upper portions of the Ordovician fauna. It recalls by its form such American Cambrian species as *Obolus* (*Lingulepis*) *acuminatus* and *Obolus* (*Lingulella*) *acutangulus.* It resembles *Lingula attenuata* in outline, but it is highly improbable that a species of this character should exist from Middle Cambrian time to Middle Ordovician time. The same is true of two other species—one doubtfully identified as *Lingula rouaulti* Salter; another as *Lingula petalon* Hicks.

The shell named *Lingula hawkei* Roualt ? is too imperfect for either generic or specific identification. In size and form it suggests Mickwitzia. Another form, *Obolella ?* sp., is probably the same as the shells referred to *Lingula petalon.* The study of specimens received from Dr. Bornemann, and the figures given by him as *Obolella crassa* Hall, lead to the conclusion that the reference to the genus and species is incorrect. The identification of *Kutorgina cingulata* Billings appears to be correct as to genus, but probably not so as to species.

The brachiopod fauna of the Cambrian of Sardinia, as described in this memoir, is as follows:

Obolus (*Lingulella*) *bornemanni* Walcott.
Obolus (?) *meneghini* Walcott.
Obolus (?) *zoppi ?* Walcott.
Kutorgina sardiniensis Walcott.
Mickwitzia ? sp. ?

A REVISION OF CERTAIN SPECIES OF PLANTS OF THE GENUS ANTENNARIA.

By Elias Nelson,
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Recent study of the genus Antennaria in North America has been confined almost entirely to the group represented by *A. alpina*, *A. dioica*, and *A. plantaginifolia* of Gray's Synoptical Flora. These, as treated by Dr. Gray, have proved to be aggregates. The names *A. alpina* and *A. dioica* were originally applied to Old World plants, and it appears that no American specimens are referable to those species. Prior to 1897 only five species of the North American continent had been described in this group, viz, *A. plantaginifolia* (Linnæus) Richardson, *A. monocephala* De Candolle, *A. solitaria* Rydberg (*A. plantaginifolia monocephala* Torrey and Gray), *A. parvifolia* Nuttall, and *A. labradorica* Nuttall. During the last four years, however, about 50 additional species have been published. The Antennarias of many parts of North America are as yet little known, and much research in connection with the genus is still necessary. Mr. Fernald has succeeded in arriving at a very satisfactory arrangement of the New England Antennarias. Those of other regions are in need of similar study.

In this paper an attempt is made at a natural arrangement of the western and northern species of this group. A tolerably satisfactory synopsis can hardly be expected until more material from this vast region is at hand. Many of the species are very imperfectly known; a considerable number from their type localities only. Especially is this true of the far northern species. Because of the great variability of the species and their very frequent and perplexing intermediate forms, a reasonably complete series of specimens representing each must be obtained before its claim to specific rank can be considered fully established. When more material is secured, it may be found that too many species have been recognized in this paper.

In the study of this genus it is of the greatest importance that the identity of each published species be definitely determined. I have been very fortunate in having had the opportunity of examining types or typical material of all the species included in this paper except *A. parvifolia*, *A. monocephala*, and *A. aizoides*. The last named is the only species of which I have seen no specimens. Although I have not seen the types of any of Dr. Rydberg's species, I have examined duplicates of all of them. This preliminary revision is based principally on the material in the United States National Herbarium and in my private collection of Antennarias. I am under great obligation to Dr. E. L. Greene for the privilege of examining types and typical specimens of the species which he has described; and through the kindness of Mr. J. M. Macoun it has been possible for me to study the types and other material preserved in the herbarium of the Geological Survey of Canada. I owe much to Mr. Frederick V. Coville and Dr. J. N. Rose, who have in many ways greatly aided me in the study of this genus and in the preparation of this paper.

The results of my investigation are incorporated in the following presentation of the species:

SYNOPSIS OF THE SPECIES OF ANTENNARIA, ALLIED TO A. ALPINA AND A. DIOICA, OCCURRING IN NORTHERN AND WESTERN NORTH AMERICA.

a. Leaves comparatively small. (*aa* on page 713.)
  b. Tips of involucral bracts green to pale brown. Segregates of A. ALPINA *of the* SYNOPTICAL FLORA. (*A. arida* may be looked for here.) (*bb* on page 704.)
    c. Heads solitary or 1—3. (*cc* on page 699.)

1. **Antennaria monocephala** DC. Prodr. **6**: 269. 1843.

Slender, 9–11 cm. high, the stolons about 1 cm. long; leaves narrowly oblanceolate, acute, and cuspidate-mucronate, 10–15 mm. long, green and glabrate above: stem floccose-woolly, with leaves less than 1 cm. long; involucres 5.5 mm. high, the bracts (of pistillate heads) comparatively broad (1 mm. or less), obtuse, brown but lighter in color toward the very tips.

Type locality.—"In insula Unalaschka". Type either in the De Candollean or the Berlin Herbarium.

Known to me only from the island of Unalaska and from near Nome City, Alaska (Flett, no. 1655, Anvil Mountain, 1900).

The above description is drawn from the specimen in the herbarium of the Geological Survey of Canada, collected by J. M. Macoun on "mountain summits," Unalaska, Bering Sea, August 22, 1891. The Alaskan specimens collected by J. B. Flett, examined by me, are all male plants. The tips of the bracts are oblong and obtuse and greenish brown, while the pappus bristles are like those of *A. exilis*.

2. **Antennaria exilis** Greene, Pittonia **3**: 288. 1898.

Low, slender, 2–8 cm. high, the stolons short; leaves spatulate, acute, 7–12 mm. long, lightly woolly on both surfaces, heads solitary; involucres about 4.5 mm. high, the pistillate bracts acute or acuminate, the staminate obtuse or acutish.

Type locality.—"St. Paul Island, Bering Sea." Collected by J. M. Macoun and by Kincaid; type in the herbarium of E. L. Greene.

Known also from Kyska Island (Baker), one of the western Aleutian Islands, and from Unalaska (Flett, no. 1789, 1900).

Closely related to *A. monocephala*, but a smaller plant with narrower pistillate bracts.

3. **Antennaria angustata** Greene, Pittonia **3**: 284. 1898.

Tufted, 4–7 cm. high, with short suberect offsets; stems leafy; leaves linear or very narrowly spatulate, 12–20 mm. long, becoming glabrate above; cauline leaves linear, spreading, the tips of at least the upper ones scarious and greenish brown or white; heads large, 1–3, usually solitary: involucres (pistillate) 6–7 mm. high, the bracts green or brown, nearly all acuminate. Male plant unknown.

Type locality.—"Coasts of Hudsons Strait." Collected by Bell; type in the herbarium of the Geological Survey of Canada (sheet no. 11248).

The type sheet contains 4 plants, representing two collections; one from Cape Prince of Wales, in which the plants (2) are about 7 cm. high and with very narrow leaves; the other from Cape Chudleigh, the plants being 4 cm. high and with leaves shorter and broader in proportion.

4. **Antennaria aizoides** Greene, Pittonia **3** : 233. 1898.

"Very loosely cæspitose, the branches rigid, stout, ascending, scarcely stolon-like, the leaves forming a rosette at summit, these thick and firm in texture, spatulate from a broad, rounded, and obtuse terminal portion, permanently silvery-white on both sides with a dense tomentum, not in the least viscid; peduncles an inch high, linear-bracted, bearing at summit about three small sessile heads; scarious tips of the involucral bracts dull brownish, those of the outer ovate, of the inner obovate: pappus bristles (only the male known) apparently oblanceolate from toward the base, serrulate."

Type locality.—"Dry, barren ground among the Cypress Hills, Northwest Territory." Collected by John Macoun; type in the herbarium of the Geological Survey of Canada (sheet no. 11245).

Since I have seen no specimens of this species, I quote Dr. Greene's description.

cc. Heads few to many.[1]

d. Far-northern species.

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[1] The following species, known to occur in Greenland, have apparently not been found on the American continent:

1. **Antennaria alpina** (L.) Gaertn. Fruct. **2**: 410. 1791. *Gnaphalium alpinum* L. Sp. Pl. 856.1753. Leaves oblanceolate, 2–3.5 mm. broad, green and glabrate above; heads several, small and narrow, the involucral bracts (pistillate) acuminate; pappus of the staminate heads not at all dilated at apex.

Type locality.—"In Alpibus Lapponiæ."

2. **Antennaria glabrata** (Vahl) Greene, Pittonia **3** : 285. 1898. *A. alpina glabrata* Vahl, in Fl. Danica **47** : *pl. 2786. fig. g.* 1868. Entirely glabrous; closely related to the preceding. For full description, see Greene, Pittonia **3** : 285. 1898. Type in the Botanical Museum at Copenhagen, collected by Vahl on the island of Disco ("paa Oen Disco"), off the west coast of Greenland.

5. **Antennaria pallida** nom. nov.

A. borealis Greene, Pittonia 4: 85. 1899, not Gandoger, 1887.

From 6 to 15 cm. high; stolons short; leaves spatulate-oblanceolate, acute, 10–15 mm. long, lightly and permanently soft-woolly on both surfaces; heads comparatively large, 2–7; involucres 6 mm. high: tips of the bracts (pistillate) broad and obtuse, dirty white or brownish in color. Male plant unknown.

Type locality.—"Disenchantment Bay, Alaska." Collected by Funston, no. 101; type in the herbarium of E. L. Greene.

Alaska (Funston, no. 101; Flett, no. 1652, near Nome City, 1900.)

This resembles *A. monocephala* in the general outline of its leaves and in its broad-bracted involucres. Its heads are considerably larger than those of *A. media.*

dd. Species of the western United States and of the Rocky Mountains of southern British America.

6. **Antennaria media** Greene, Pittonia 3: 286. 1898.

Rarely more than 6 cm. high; stolons 1–3 cm. long; leaves spatulate-oblanceolate, often narrowly so, abruptly acute or acute, 15 mm. or less long, white or grayish-tomentose on both surfaces; involucres (pistillate) about 4 mm. high; tips of the pistillate bracts oblong to oblong-linear, obtuse, rarely acutish, green, greenish brown, rarely light brown and whitish at the very tips; tips of the staminate bracts oval, obtuse, of same color as the pistillate ones.

Type locality.—"Mountains above Coldstream, Placer County, California." Collected by Sonne; type in the herbarium of E. L. Greene.

From the mountains of California to British Columbia and in the Rocky Mountains from Colorado to Alberta.

While typical *A. media* is found in the mountains of the Pacific coast States, there occur in the Rocky Mountains plants which agree so closely with the far-western ones that they must be referred to the same species. As in *A. umbrinella*, the leaves of the last season are often green and glabrous. The male plants, though much less common than the female, are not rare, and, as noted by Dr. Greene, their pappus bristles are very distinctly dilated at apex, in this respect very different from those of *A. alpina.*

Antennaria media ciliata subsp. nov.

Depauperate, less than 3 cm. high, beset with minute, short, glandular-tipped hairs about the glomerule, on the foliar bracts and lower half of the leaves.

Type locality.—White Mountains, Mono County, California. Collected by Shockley, no. 444; type in the United States National Herbarium.

In the White Mountains (Shockley, 1886) and Sierra Nevada (Coville and Funston, no. 2160, 1891, near Farwell Gap) of California.

7. **Antennaria macounii** Greene, Pittonia 3: 276. 1898.

Stems 4–7 cm. high; stolons slender, leafy terminally, 2–4 cm. long;

leaves spatulate, the terminal portion broad and only abruptly acute, 11–14 mm. long, 4 mm. or less broad, striately hoary-tomentose; involucres about 5.5 mm. high, the tips of the bracts (pistillate) narrow, obtuse or acute, greenish brown, rarely whitish. Male plant unknown.

Type locality.—"Revelstoke, B. C." Collected by John Macoun; type in the herbarium of the Geological Survey of Canada (sheet no. 11241).

Only the type specimen seen.

This is very closely related to *A. umbrinella*, having the same indument and somewhat similar heads but more spatulate leaves. It is also closely related to *A. media*, the only very striking difference being that its leaves are more dilated terminally.

8. **Antennaria tomentella** sp. nov.

Cespitose, about 1 dm. high, with slender stems and procumbent, somewhat flexible stolons; leaves oblanceolate, acute, prominently mucronate, 16–20 mm. long, tomentose or canescent beneath, sparsely so above, the indument more or less persistent; cauline leaves linear, acute to acuminate; heads 4–6, glomerate; involucres 5–6 mm. high; bracts (pistillate) in 2–3 series, nearly all obtuse, the tips greenish brown, oval in the outer to oblong or linear-oblong in the inner. Male plant unknown.

Type locality.—Near Stevens Pass, Cascade Mountains, Washington. Collected by Sandberg and Leiberg, no. 751; type in the United States National Herbarium.

The leaves of this plant are noticeably larger than in related species, and the very light indument of the upper surface is quite characteristic.

9. **Antennaria umbrinella** Rydb. Bull. Torr. Club **24**:302. 1897.

A. mucronata E. Nelson, Bot. Gaz. **27**:209. 1899.[1]

Ten to 15 cm. high; stolons 4 cm. long or less; leaves narrowly spatulate-oblanceolate, acute or abruptly acute and mucronate, 15–25 mm. long, canescent on both surfaces, rarely tomentose; involucres 5–6 mm. high; tips of the bracts (pistillate) oblong or oblong-lanceolate, obtuse, rarely acutish, greenish brown, the very tips often whitish. Typical male plants unknown.

Type locality.—"Long Baldy, in the Little Belt Mountains," Montana. Collected by Flodman, no. 859 (in part); type in the herbarium of the New York Botanical Garden.

Wyoming and Montana to Oregon (Coville and Leiberg, no. 431.)

This species is nearer to the European *A. alpina* than any other West American Antennaria. It is very difficult to separate from *A. media.* It is, however, a much larger plant, with larger heads and leaves which are canescent rather than tomentose. The two species apparently intergrade, and it is probable that *A. media* can not be maintained except as a variety. *A. umbrinella* is found only at high elevations in the mountains.

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[1] *Type locality.*—"La Plata mines, in the Medicine Bow mountains," Wyoming. Collected by Elias Nelson, no. 5211; type in the Rocky Mountain Herbarium, University of Wyoming, Laramie.

In describing *A. umbrinella* Dr. Rydberg confused two species. I would hesitate to make this assertion had I not examined two cotypes, and Dr. Rydberg has sent me a male and a female head taken from the type sheet. The male and female plants of his type are of different species. One of these he later named *A. flavescens*, and the staminate plants of this and his *A. umbrinella* are identical. The name *A. umbrinella* must be applied to the species represented by the female plants of his type, since the species represented by the male plants was described by me as *A. reflexa* and by Dr. Rydberg, as already noted, as *A. flavescens*. In this connection it may be well to call attention to the more salient characters of the male and female plants of the type of the original *A. umbrinella*. The leaves of the staminate (*A. reflexa*) are spatulate, obtuse or abruptly acute, and with an appressed tomentum. The leaves of the pistillate are narrower and mucronate; the indument lighter and looser, canescent rather than tomentose. *A. umbrinella* is quite different in general appearance from *A. reflexa* and is much more readily separated from it than from *A. media*.

The bracts of the type are much broader than in some other specimens, such as Flodman's no. 862, which duplicates the type very nicely as to leaves and habit.

10. **Antennaria pulvinata** Greene, Pittonia **3**: 287. 1898.

Pulvinately cespitose, with very short, rosulate-leafy closely compacted offsets; stems 4–10 cm. high; leaves spatulate-obovate to spatulate, obtuse or only abruptly acute, about 1 cm. long, white-tomentose on both surfaces; involucres 6–7 mm. high, the bracts (pistillate) either broad and imbricated or narrow and fewer and nearly equal, their tips obtuse or acute, black-green to brown in color. Male plant unknown.

Type locality.—"Alberta." Collected by John Macoun, nos. 18491, 18493, 18495, 18498; type sheets in the herbarium of E. L. Greene.

Alberta, British Columbia, and Montana (R. S. Williams, no. 729).

In habit and leaves this is very different from the related *A. umbrinella*, *A. macounii*, and *A. media*. In its involucres this species presents a variation which is almost dimorphic. In several other species a variation as to the breadth and length of the involucral bracts may be noticed, but in none is it as prominent as in this. The form with the broad-bracted and imbricated involucres was mistaken by Dr. Greene for the male plant, while the one with narrow bracts is the "female plant" of his description.

Antennaria pulvinata albescens subsp. nov.

About 4 cm. high; leaves 5–8 mm. long; involucres about 5 mm. high; bracts (pistillate) imbricated and in about 3 series, rarely nearly equal, their tips oval to oblong, obtuse, sordid white, pinkish white, or pale brown.

Type locality.—Mount Fops, Salmon River Mountains, Texas district, Idaho. Collected by Henderson, no. 3870; type in the United States National Herbarium.

Idaho (Henderson, 1895) and Montana (Rydberg and Bessey, no. 5162).

This has the pulvinate habit and imbricated involucres of the species, but is smaller in every way, and the tips of the bracts are much lighter in color. It may prove to be a distinct species.

11. **Antennaria austromontana** sp. nov.

Cespitose, the stems stout, leafy, about 5 cm. high; leaves spatulate, obtuse, or abruptly acute, 8–15 mm. long, 4–5 mm. broad, loosely woolly on both surfaces; lower cauline leaves oblong-linear, nearly as broad as and longer than those of the short stolons; heads rather large, 3–5, the lower one or two often on pedicels 5–10 mm. long; involucres about 6 mm. high; bracts (pistillate) more or less unequal, in about 3 series, their tips rather broad, ovate in the outer to oblong or lanceolate in the inner, obtuse, blackish green or brown, the very tips often pale brown. Male plant unknown.

Type locality.—Marysvale, Utah. Collected by Jones, no. 5522; type in the United States National Herbarium.

Utah (Jones, nos. 5522, 5770i) and Colorado (Baker, Earle and Tracy, no. 626).

A low, rather stout species, with ample cauline leaves, much less matted than *A. pulvinata*, but resembling it in its heads and in the general outline of its leaves. The indument is loose and dull white or grayish in color, not appressed and shining, as in that species. It is distinguished from *A. media* by its larger heads and obtuse leaves, while as compared with *A. umbrinella* it has broader leaves and is a lower and much stouter plant.

12. **Antennaria fusca** E. Nelson, Bot. Gaz. **30**: 120. 1900.

About 1 dm. high; leaves spatulate, obtuse and more or less truncate at apex, indistinctly mucronate, about 2 cm. long, 5–7 mm. broad, canescently tomentulose or striate woolly on both surfaces; involucres 6–7 mm. high, the tips of the bracts (pistillate) oblong or oblong-linear, obtuse, greenish brown to buff color. Male plant unknown.

Type locality.—"On dry bottoms and in open woods on Lewis river, Yellowstone park," Wyoming. Collected by Aven and Elias Nelson, no. 6356; type in the Rocky Mountain Herbarium, University of Wyoming, Laramie.

Known to me only from type locality and from the Medicine Bow Mountains of southern Wyoming (Aven Nelson, no. 7901, 1900).

This is nearest to *A. umbrinella*, but has larger heads, and leaves more like those of *A. aprica*. The heads are on longer pedicels than is usually the case in the species of this group.

13. **Antennaria reflexa** E. Nelson, Bot. Gaz. **27**: 208. 1899.

A. flavescens Rydb. Mem. N. Y. Bot. Garden, 1: 411. 1900.[1]

Slightly suffrutescent, 5–15 cm. high; leaves spatulate or spatulate-obovate, obtuse, 6–15 mm. long, usually 1 cm., dull, grayish-white tomentose on both surfaces; involucres 4–5 mm. high, the bracts few, in less than 3 series, the tips of the pistillate usually from oval in the outer to oblong-linear in the inner, all obtuse, less frequently ovate or lanceolate in the outer to linear in the inner and acute or acuminate, in color from greenish brown to yellowish white, rarely rose color, tips of the staminate oval, obovate or oblong, obtuse or truncate, usually of firm texture, like the pistillate ones as to color.

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[1] Type locality, "Bridger Mountains," Montana. Collected by Rydberg and Bessey, no. 5145; type in the herbarium of the New York Botanical Garden.

Type locality.—"Centennial Valley," southern Wyoming. Collected by Aven Nelson, no. 1265; type in the Rocky Mountain Herbarium, University of Wyoming, Laramie.

Wyoming and Montana.

A dry ground species, occurring on high hills and occasionally on open plains at subalpine elevations. It is characterized by its short, very plain, obtusish leaves, which are invested with an appressed and often yellowish tomentum. The heads are very small and the tips of the staminate bracts are rather firm in texture and inclined to be folded back. The type of the species is a form with acute, green, pistillate bracts and greenish brown staminate ones. Dr. Rydberg based his *A. flavescens* (no. 5145, the type of this, is composed of staminate plants.) on specimens which as to habit and leaves are essentially those of the type of *A. reflexa*. The bracts, however, are lighter in color.

14. **Antennaria confinis** Greene, Pittonia **4**:40. 1899.

More or less suffrutescent, the stems slender, about 1 dm. high, rarely 15 cm.; leaves mostly oblong-spatulate, obtusish to acute, about 1 cm. long, rarely longer, tomentose on both surfaces and dull in color; involucres 4–5 mm. high, the bracts few, the tips of the pistillate ones oval to oblong, obtuse, brownish yellow to dull white, tips of the staminate oval or obovate, brownish to nearly white.

Type locality.—"Santa Catalina Mountains, Arizona." Collected by Lemmon; type in the herbarium of E. L. Greene.

Arizona, California (Lemmon, Sierra Nevada Mountains, 1875; Coville and Funston, no. 1658), Nevada (Watson, nos. 650, 651), Oregon (Leiberg, no. 331; Cusick, no. 1924), and Idaho (Henderson, no. 3514).

Nearest to *A. reflexa* and replacing it west of the Rocky Mountains. It approaches very closely to that species, yet the typical form is quite different in being more distinctly suffrutescent and slightly viscid throughout and in having "oblong-spatulate" rather than spatulate leaves and lighter-colored involucral bracts. It is very similar to *A. arida*, being distinguished from the latter by its suffrutescent habit, viscidulous leaves and stems and pale brown bracts.

bb. Tips of involucral bracts not brown or green. Segregates of A. DIOICA *of the* SYNOPTICAL FLORA. (Albinos of *A. reflexa* and *A. confinis* may be looked for here; also *A. reflexa* with rose-colored bracts.)

c. Leaves coriaceous.

15. **Antennaria suffrutescens** Greene, Pittonia **3**:277. 1898.

Leaves small and glabrous above, spatulate; heads solitary.

Type locality.—"Near Waldo, Oregon." Collected by Howell; type in the United States National Herbarium.

Of all the species of Antennaria that have been recently described this is certainly the most remarkable. It has leaves totally different from at least all North American species. The margins of the lower half are revolute and the very apex is recurved so as to make the leaf appear retuse.

ee. Leaves not coriaceous.

f. Heads comparatively small, the involucres 5–6 (4–7) *mm. high.* (*ff.* on page 711.)

g. Tips of involucral bracts rose color, or rarely whitish. (*A. arida* with rose-colored bracts may be looked for here.) (*gg.* on page 707.)

16. **Antennaria concinna** sp. nov.

Cespitose, with leafy offsets or procumbent stolons, the latter at most 5 cm. long; stems slender, leafy, 10–15 cm. high; leaves spatulate with no distinction of blade or petiole, scarcely abruptly acute, about 1 cm. long and 2–4 mm. broad, white-tomentose on both surfaces; the cauline linear-oblong to linear, acute, shorter than the internodes; heads 6–8 and glomerate, or often as many as 15, and the cluster then rather open; involucres 6–7 mm. high; bracts (pistillate) in about 3 series, all obtuse and about 1 mm. wide, the herbaceous portion of a livid green, the outer bracts with a brown middle portion and their tips light brown, the tips of the others rose color or yellowish white. Male plant unknown.

Type locality.—Olympic Mountains, Clallam County, Washington. Collected by Elmer, no. 2417 (in part); type in the United States National Herbarium.

Washington and Oregon (Cusick, no. 1925, in part) to Utah (Jones, nos. 5375u, 5422c, 5441x.)

This somewhat resembles *A. pulvinata* as to foliage, but its affinities are with *A. rosea.* It is characterized by its short, obtusish, white-tomentose leaves. In *A. rosea* and all its forms the leaves are distinctly acute and the tomentum usually dull and grayish in color. The Utah specimens have larger radical leaves than the type and longer cauline ones.

17. **Antennaria speciosa** sp. nov.

Cespitose, 10–17 cm. high, the stolons short and leafy; leaves narrowly oblanceolate, acutish, 1–2 cm. long, about 4 mm. wide, lightly hoary-tomentose or canescent and permanently so on both surfaces; heads 9–15 in a rounded cluster, nearly all pedicellate; involucres about 7 mm. high; bracts (pistillate) numerous, imbricated, in about four series, the inner less than half as broad and acute to acuminate, the non-herbaceous portion rose color or nearly white. Male plant unknown.

Type locality.—Bear Valley, in the San Bernardino Mountains, California. Collected by Parish, no. 3354; type in the United States National Herbarium.

San Bernardino and San Jacinto (H. M. Hall, no. 718, 1897) Mountains, California.

A very pretty species, with much larger heads than *A. rosea* and quite different involucres.

18. **Antennaria rosea** (Eaton) Greene, Pittonia **3**: 281. 1898.

A. parvifolia Nutt. Trans. Am. Phil. Soc. **7**: 406. 1841, in part (as to female plant).
A. dioica rosea Eaton, Bot. King Surv. 186. 1871, name only.
A. parvifolia rosea Greene, Pittonia **3**: 175. 1897, name only.

Slender, 2–4 dm. high; sterile basal branches ascending to erect, rarely prostrate; the canescent tomentum of the leaves and the striate wool of the stems slightly viscid; leaves very narrowly oblanceolate or elongated spatulate, acute, 15–20 mm. long, less than 5 mm. wide; heads in close and rounded or often rather open clusters; involucres 5–6 mm. high; bracts (pistillate) in about three series, nearly equal or somewhat imbricated, the tips oval to linear, usually all obtuse, rose color to dull white. Male plant unknown.

From Colorado to Alberta and westward to the Pacific coast.

This is the most widely distributed as well as the most polymorphic of our western species. It runs into numerous and perplexing forms. It usually grows on dry ground, especially on partially wooded slopes, but is often found on the drier bottoms. This species and its variety *angustifolia* are slightly viscid and oily, as it were. This is especially true of the dull and grayish indument of the radical leaves. Neither in this species nor in its immediate relatives do we find any minute glandular hairs such as often occur in *A. parvifolia*.

Antennaria rosea angustifolia (Rydb.) comb. nov.

A. angustifolia Rydb. Bull. Torr. Club **26**: 546. 1899.
A. sordida Greene, Pittonia **4**: 81. 1899,[1] not Sch. Bip. 1854.

Lower and more subligneous than the species and more viscid; leaves smaller, often very narrow; inflorescence more congested; heads as in the species and with the same variation as to the color of the bract tips. Male plant exceedingly rare.

Type locality.—"Yosemite Valley," California. Collected by Torrey; type in the Torrey Herbarium.

As compared with the species, this variety grows in dryer and more exposed situations and at higher altitudes. It grades so imperceptibly into *A. rosea* that its recognition as a species would not be justifiable. In this variety, as often in the species, the leaves when stripped of the indument usually present a granular and livid green surface. The only male plants of the *A. rosea* group of which I have any knowledge are those of Rydberg and Bessey's, no. 5159. These plants appear to belong here rather than with the species. The tips of the bracts are obovate or oval, obtuse, and of a dull white color.

The names *A. angustifolia* and *A. sordida* Greene were applied to plants not materially different. As to leaves and habit they agree very well. The first was based on an albino form of the Sierra Nevada of California and the latter on a low tufted form of higher elevations of the southern Rocky Mountains.

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[1] Type locality, "North Park, near Teller," Colorado. Collected by Sheldon, no. 128; type in the herbarium of E. L. Greene.

Antennaria rosea divaricata subsp. nov.

Stems stout, leafy, 15–20 cm. high; leaves rather large, with a more or less elongated petiolar base and narrowly oblanceolate blade, 2–3 cm. long, 5–7 mm. broad, the cauline linear or oblong linear spreading, about 25 mm. long. Male plant unknown.

Type locality.—Divide on the road from Custer to Challis, Idaho. Collected by Henderson, no. 3636; type in the United States National Herbarium.

Washington (Elmer, no. 2419, 1900) and Idaho to Colorado (Baker, Earle and Tracy, no. 655).

Antennaria rosea imbricata E. Nelson, comb. nov.

A. imbricata E. Nelson, Bot. Gaz. **27**: 211. 1899.

Leaves with obovate or oblanceolate blade, obtusish, 20–25 mm. long, about 5 mm. wide, thin in texture, the indument appressed, whitish; involucral bracts (pistillate) broader than in the species, in about four series, imbricated, rose color to nearly white. Male plant unknown.

Type locality.—"North fork of Crow creek in the Laramie hills," Wyoming. Collected by Elias Nelson, no. 2036; type in the Rocky Mountain Herbarium, University of Wyoming, Laramie.

Wyoming and Montana to California (Hall and Chandler, no. 647, in part) and Oregon (Leiberg, no. 516).

A very good variety, easily distinguished from the species, but connected with it by intermediate forms. It is a meadow plant, somewhat resembling the large-leaved form of *A. parvifolia* of higher altitudes.

gg. Tips of involucral bracts white.

h. Stems 6–30 cm. high, several to many in congested or open corymbose cymes. (*hh*, on page 710.)

19. **Antennaria nardina** Greene, Pittonia **4**: 82. 1899 (December).

A. corymbosa E. Nelson, Bot. Gaz. **27**: 212. 1899 (March),[1] not *A. alpina corymbosa* Hartman, 1846(?).

Stem slender, 12–25 cm. high; stolons flexible; leaves from almost linear to narrowly oblanceolate, rarely oblanceolate, acute, cuspidately mucronate, 25–35 mm. long, canescent or lightly tomentose, rarely green and glabrate; heads more or less pedicelled and corymbosely disposed; involucres 4–5 mm. high; bracts with a brownish spot at the middle, the tips dull white or milky white, the pistillate ones ovate to oblong, obtuse, the staminate rotund to oblong, obtuse or truncate.

Type locality.—"Mt. Massive, near Leadville, Colorado." Collected by Holm; type (male plants only) in the herbarium of E. L. Greene.

Mountains of Colorado, Wyoming, and Montana.

One of the best of recently described species, being unusually well marked and less variable than other Rocky Mountain species. It usually grows in wet alpine meadows.

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[1] *Type locality.*—"Battle lake, in the Sierra Madre mountains," southern Wyoming. Collected by Aven Nelson, no. 4160; type in the Rocky Mountain Herbarium, University of Wyoming, Laramie.

20. **Antennaria foliacea** Greene, Pittonia 3: 279. 1898.

About 3 dm. high; leaves broadly spatulate to cuneate-obovate, thin in texture, 15–20 mm. long, about 1 cm. broad or less, the cauline about 4 cm. long, 6–12 mm. wide; heads pedicelled in an open cyme; involucres dull in color, about 6 mm. high, the bracts unequal. Male plant unknown.

Type locality.—"Little Belt Mountains, Montana." Collected by Flodman, no. 867; type in United States National Herbarium.

The type is the only specimen of this species known to me. It is a meadow plant, whose affinities are with *A. parvifolia.*

21. **Antennaria bracteosa** Rydb. Mem. N. Y. Bot. Garden 1: 413. 1900.

About 3 dm. high; leaves broadly spatulate, thin in texture, canescent or tomentose, 15–20 mm. long, the cauline about 3 cm. long; involucral bracts (pistillate) narrow, the tips white, acutish to acuminate. Male plant unknown.

Type locality.—"Jack Creek," Montana. Collected by Rydberg and Bessey, no. 5144; type in the herbarium of the New York Botanical Garden.

This is a doubtful species, as little known as *A. foliacea.* It appears to be intermediate between that and *A. parvifolia.* Its leaves resemble those of the former, while its heads are more like those of the latter. It is glandular above, with the ciliate hairs which so often appear in *A. parvifolia.* The plants in the two cotypes which I have examined are rather immature.

22. **Antennaria parvifolia** Nutt. Trans. Am. Phil. Soc. II. 7: 406. 1841.

A. microphylla Rydb. Bull. Torr. Club 24: 303. 1897,[1] not Gandoger, 1887.

Slender, 1–3 dm. high; stolons short, procumbent; leaves rhomboidally spatulate and acute or rarely with the terminal dilated portion obovate and obtuse, 5–15 mm. long, silvery-tomentose on both surfaces or only canescent above; heads in a rounded cluster or in an open corymb; involucres 5–6 mm. high; tips of the pistillate bracts usually narrow, obtuse, or acute, dull white or somewhat yellowish; those of the staminate bracts rotund to oblong, obtuse or truncate, dull white or yellowish white.

Type locality.—"On the Black Hills and plains of the upper part of the Platte." Collected by Nuttall; type in the herbarium of the Philadelphia Academy.

Colorado, Utah, eastern Idaho, Wyoming, Black Hills of South Dakota, Montana, northward in British America to Alberta.

This is distinctively a meadow species, and therefore much later in flowering than the dry ground species of the same locality. It flowers fully a month later than *A. aprica* of the dry, open plains and slopes and from two to three weeks later than *A. reflexa* and *A. arida*. Nearly all forms of this species are more or less glandular and green about the inflorescence and often ciliate as well. The nonglandular forms are less common and quite different in appearance, their involucres much like those of *A. foliacea*. A narrow-leaved form has been collected by Rydberg and Vreeland, no. 5450, in southern Colorado.

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[1] *Type locality.*—"Manhattan," Montana. Collected by Rydberg, no 2831; type in the Columbia Herbarium.

Dr. Rydberg claims that *A. parvifolia* Nuttall is *A. rosea* (Eaton) Greene, but Nuttall's description does not apply to that plant. The leaves of *A. rosea* are not "whitely tomentose," but "canescently tomentose" and dull as to color. "Radical leaves, somewhat rhomboidally spatulate," exactly describes the plant which Dr. Rydberg named *A. microphylla*. The stolons of *A. rosea* are hardly "procumbent," but ascending or assurgent. It is also very improbable that Nuttall had staminate plants of *A. rosea*, since those are extremely rare. I doubt very much whether Nuttall would have described *A. rosea* (Eaton) Greene as having "whitely tomentose" and "somewhat rhomboidally spatulate leaves" and "procumbent sarments." If the Nuttallian specimen seen by Dr. Rydberg is *A. rosea* (Eaton) Greene, then we are led to believe that it is not what Nuttall had before him when drawing up his description. The characterization which Nuttall gives is of the male plant, and, apparently, he had dwarf specimens.

23. **Antennaria nitida** Greene, Pittonia **3**: 283. 1898.

Stems 6–7 cm. high; leaves spatulate, obtusish, 7–10 mm. long, 2.5 mm. wide, covered with a white, glistening indument; lower portion of involucral bracts and the foliar bracts of the inflorescence beset with short glandular hairs; involucres 6 mm. high, the tips of the bracts (staminate) yellowish white, oblong to oval, obtuse, entire or bluntly few-toothed at summit. Female plant unknown.

Type locality.—"Charlton Island, James Bay." Collected by J. M. Macoun; type in the herbarium of the Geological Survey of Canada (sheet no. 11272).

A northern relative of *A. parvifolia*, characterized by its obtusish leaves and viscid indument.

24. **Antennaria arida** E. Nelson, Bot. Gaz. **27**: 210. 1899.

Seven to 15 cm. high; leaves small (8–12 mm. long) and inclined to be conduplicate, spatulate, acute, hoary-tomentose; involucres about 6 mm. high, the bracts (pistillate) nearly all equal, obtuse, or somewhat imbricated and acutish, the tips dull white, very rarely pinkish. Male plant unknown.

Type locality.—"Tipton" in "the arid region of southwestern Wyoming." Collected by Aven Nelson, no. 4798; type in the Rocky Mountain Herbarium, University of Wyoming, Laramie.

Wyoming, Utah, and Colorado.

Distinctly an arid species, being the low, hoary, whitish-bracted plant so common on plains and gentle slopes in southern Wyoming. It flowers nearly as early as *A. aprica* and at least three weeks earlier than *A. parvifolia* of the meadows. It bears some resemblance to *A. reflexa*, but is readily distinguished by its somewhat larger heads with white-tipped bracts, and by its leaves, which are acute, standing more or less erect, and inclined to be conduplicate. The leaves of *A. reflexa*, on the other hand, are usually spreading and always plane. From the very similar *A. confinis* of the far west it differs in being closely matted and appressed to the ground and not at all viscidulous.

Antennaria arida viscidula subsp. nov.

Size, habit, and leaves of the species, but glandular about the inflorescence, stem, and usually on the leaves below; middle portions of outer bracts (pistillate) greenish yellow or brown, the tips dirty white or pale brown.

Type locality.—Laramie Peak, Wyoming. Collected by Aven Nelson, no. 7570; type in the Rocky Mountain Herbarium, University of Wyoming, Laramie.

Wyoming, and Colorado (Rydberg and Vreeland, no. 5455, 1900).

Antennaria arida humilis (Rydb.) comb. nov.

A. foliacea humilis Rydb. Mem. N. Y. Bot. Garden 1: 414. 1900.

General aspect of the species but taller, 15–20 cm. high, rarely more; the leaves somewhat larger; the involucral bracts more unequal.

Type locality.—"Bridger Mountains," Montana. Collected by Rydberg and Bessey, no. 5149; type in the herbarium of the New York Botanical Garden.

Montana and Wyoming.

This has nothing to do with *A. foliacea*, which is a very broad-leaved species growing in meadows. It is a well-marked form of *A. arida* and may be maintained as a variety of the latter. I was at first inclined to recognize it as a species, but since it grades imperceptibly into *A. arida* I have preferred to treat it as a variety. As to habit, it is more subligneous and with longer stolons than the species, and occurs in the hills on gravelly ridges and rocky slopes rather than on the plains. In some respects it approaches *A. oxyphylla*, which has very different involucres. This variety is rather common in the hills bordering on the Laramie Plains, where I observed and collected it repeatedly in the spring of 1900 (nos. 236, 240, 247, 251, 255). Nos. 247 and 255 are of the male plant. The staminate heads are similar to those of *A. reflexa*, but larger, the tips of the pappus bristles very much dilated, and the bract tips very broad and obtuse, sordid white or very pale brown.

25. **Antennaria scariosa** E. Nelson, Bot. Gaz. **27**: 210. 1899.[1]

Three to 10 cm. high; leaves spatulate, obtuse or acutish, hoary-tomentose, about 14 mm. long; cauline leaves ample; bracts (pistillate) with broader tips that in *A. arida.*

Type locality.—"Leroy, Uinta County," southwestern Wyoming. Collected by Aven Nelson, no. 4587; type in the Rocky Mountain Herbarium, University of Wyoming, Laramie.

hh. Heads sessile and solitary or 2 or 3 together on much abbreviated rosulate-leafy stems.

26. **Antennaria rosulata** Rydb. Bull. Torr. Club **24**: 300. 1897.

Densely matted and depressed, the heads scarcely rising above the leaves; these spatulate, obtuse or acutish, 6–10 mm. long; involucres about 7 mm. high.[1]

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[1] I propose the new name *Antennaria petaloidea modesta* for *A. petaloidea scariosa* Fernald, Rhodora 1: 73. 1899 (April), not *A. scariosa* E. Nelson, Bot. Gaz. **27**: 210. 1899 (March).

Type specimens in the Columbia Herbarium, collected by Mearns, no. 40 (Mogollon Mountains, Arizona), and by Palmer, no. 109 (Arizona).

Arizona (Palmer, no. 109; Toumey, no. 599; MacDougal) to southern Colorado (Baker, no. 627; Rydberg and Vreeland, no. 5449).

Mr. Baker's specimens, determined by Dr. Greene, were distributed under an herbarium name, but I can not see in them anything specifically distinct from the Arizonian plants.

ff. Heads comparatively large, the involucres averaging 8 (7–9) mm. high.[2]

27. **Antennaria aprica** Greene, Pittonia 3:282. 1898.

A. holmii Greene, Pittonia 4:81. 1899.[3]

Low and usually densely matted, less than 15 cm. high; leaves cuneate-obovate to narrowly oblanceolate, permanently tomentose on both surfaces, acute to obtuse; heads large for the plant, the pistillate involucres 6–8 mm. high; bracts numerous and imbricated, the tips in the female plant acute or obtuse, dull white or pink, often with a brown spot at the base of the scarious portion, in the male plant broad and obtuse, white.

Dry ground along foothills and on open plains; from New Mexico northward to Assiniboia and Manitoba; also in Utah, western Nebraska, and western South Dakota.

Of this common Rocky Mountain species I have examined some 50 sheets. Though quite variable and running into numerous forms, it is well marked and readily distinguished from related species. The typical form has "cuneate-oblanceolate acutish" leaves and dull white bract tips, but forms with much broader and obtuse leaves are common, and pink-tipped bracts or brown-spotted ones may be found in most of the forms. The pistillate bracts in the majority of sheets examined are obtuse. Forms with narrower and acute or acutish bracts, however, are not uncommon, and these apparently are of frequent occurrence in southern Colorado. The male plants are much less common than the female ones. On the Laramie Plains of southern Wyoming the one is about as common as the other. The pistillate bracts have obovate or oval, obtuse tips, and the dilated portion of the pappus is linear to oblong-linear and serrate, or nearly entire. I can not regard *A. holmii* in any other light than as one of the many forms of this species.

28. **Antennaria recurva** Greene, Pittonia 3:290. 1898.

Like the preceding, but less cespitose, the stolons short and stout, rooting tardily, very leafy terminally; leaves narrowly spatulate, acutish, inclined to be conduplicate and recurved near the tip, permanently hoary-tomentose on both surfaces, and more densely so beneath;

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[1] For full description, see Pittonia 3:289. 1898.

[2] The following ally of *A. dioica* occurs in Greenland:

A. hyperborea (Winch.) Don, in Engl. Bot. Suppl. *pl. 2640.* 1831. *Gnaphalium hyperboreum* Winch. Arr. ed. 7. 3:926. 1830. Also found in northern Europe.

[3] *Type locality.*—"In open places among the more elevated pine woods on Longs Peak, Colorado." Collected by Holm; type in the herbarium of E. L. Greene.

involucral bracts of the female plant obtuse, fewer than in the preceding species. Male plants unknown.

Type locality.—"Vicinity of Flagstaff, northern Arizona." Collected by MacDougal; type in the United States National Herbarium.

Apparently a good species, but little known, and founded on very immature pistillate plants, in which the stems are only an inch high.

29. **Antennaria marginata** Greene, Pittonia 3:290. 1898.

Like *A. aprica*, but leaves glabrous above, or nearly so, and prominently mucronate; staminate involucral bracts with rhomboid-ovate and obtuse or acute tips.

Type in the United States National Herbarium, collected in New Mexico by Fendler; nos. 523 (male), 521a (female).

New Mexico and southern Colorado.

A New Mexican ally of *A. aprica*, which it appears to replace almost entirely in that territory. It is often somewhat suffrutescent, and the old leaves are occasionally conduplicate and recurved, as in the preceding species. It is more or less glandular above, with minute gland-tipped hairs on the pedicels, foliar bracts, and outer involucral bracts. The typical specimens are from 3-8 cm. high, but the species is often 15 cm. high, or more. The involucral bracts of the male plant are subcoriaceous up to the ovate or lanceolate acutish petaloid portion. It has been collected by G. C. Nealley, no. 46, Pinos Altos, New Mexico, and by Rydberg and Vreeland, in southern Colorado. Less typical specimens have been secured by Mr. Heller, no. 3612, near Santa Fe.

30. **Antennaria insularis** Greene, Pittonia 3:276. 1898.

Five to 10 cm. high; leaves broadly spatulate or obovate, only abruptly acute, glabrous or glabrate above; pistillate involucres 7–8 mm. high.

Type locality.—"Islands off the Alaskan coast." Collected by Baker (Kiska Island) and by Townsend (Adakh Island); type sheets in the United States National Herbarium.

Alaska (L. M. Turner, 1880) and adjacent islands.

This bears a superficial resemblance to the southern *A. marginata*, but is a broader-leaved species, with heads more like those of *A. aprica*.

31. **Antennaria oxyphylla** Greene, Pittonia 4: 284. 1901.

Fifteen to 25 cm. high; leaves spatulate-obovate, permanently tomentose on both surfaces, 2 cm. long or less; heads 6–15; involucres 7–8 mm. high; bracts in about 4 series, imbricated, "all acute and of a rather dull white," rarely pinkish. Male plant unknown.

Type locality.—"Spanish Basin, Gallatin Co., Montana." Collected by Rydberg and Bessey, no. 5148; type in the herbarium of E. L. Greene.

Southern Wyoming to the Black Hills of South Dakota, Montana, and southeastern British Columbia.

This is a dry ground species, in general appearance resembling *A. rosea* and *A. parvifolia*, but its comparatively large heads, with numerous involucral bracts, show it to be an ally of *A. obovata* and *A. aprica*. The involucral bracts are not as narrow as those of the former and more acute than those of the latter. Dr. Greene founded the species on somewhat immature specimens, the heads not being fully developed. Maturer specimens have been collected by Leslie Goodding (no. 7288 of the Rocky Mountain Herbarium) in the Laramie Hills, southern Wyoming, June 12, 1900. Dr. Rydberg's no. 795 from the Black Hills exemplify the species in its mature condition, and John Macoun has secured it at Deer Park, Lower Arrow Lake, British Columbia, 1890.

aa. Leaves comparatively large. Segregates of the A. PLANTAGINIFOLIA *of the* SYNOPTICAL FLORA; *western allies* of A. NEGLECTA. Only the fertile plants known.

32. **Antennaria obovata** E. Nelson, Bot. Gaz. **27**:213. 1899.

Two to 3 dm. high; leaves permanently tomentose on both surfaces, 3–5 cm. long, the blade cuneate-obovate, obtuse, and about 13 mm. broad.

Type locality.—"Near Soldier Cañon," Colorado. Collected by Cowan; type in the herbarium of Colorado Agricultural College.

Foothills along the eastern base of the mountains in Colorado and in the Black Hills of South Dakota (Forwood no. 228a, Rydberg no. 793).

33. **Antennaria pedicellata** Greene, Pittonia **3**: 175. 1897.

Like *A. howellii*, but leaves smaller, oblanceolate, acute, with no distinction of blade or petiole and permanently tomentose on both surfaces.

Type locality.—"Blue Mountains of Oregon." Collected by Howell, no. 1522; type in the herbarium of E. L. Greene.

A little-known species, closely related to the following. The type specimen is quite noticeably glandular on the leaves, stem, pedicels, and outer bracts of the involucres. G. R. Vasey's no. 485, from Washington, seems to belong here.

34. **Antennaria howellii** Greene, Pittonia **3**: 174. 1897.

Two to 3 dm. high; stolons slender and prostrate; leaves usually distinctly petioled with cuneate-obovate, acute or acutish blades, glabrous above or nearly so, 3–5 cm. long.

Type locality.—"Mt. St. Helen, Oregon." Collected by Howell; type in the herbarium of E. L. Greene.

Oregon to British Columbia and eastward to western Montana.

Typical specimens have leaves which are glabrous above but plants with the leaves arachnoid on the upper surfaces are not uncommon. The heads are often on pedicels as long as those of *A. pedicellata.*

35. **Antennaria petasites** Greene, Pittonia **3**: 277. 1898.

Eighteen to 27 cm. high; cauline leaves, ample, green, and glabrous above, 2–3 cm. long, 5 mm. broad; heads panicled, the panicle conspicuously leafy-bracted.

Type locality.—"Sterile knolls and banks, Drew's Harbour, British Columbia." Collected by Dawson; type in the herbarium of the Geological Survey of Canada (sheet no. 11292).

The type consists of two plants without radical leaves or stolons. The species appear to be related to *A. howellii*, whose cauline leaves are small and inconspicuous.

DESCRIPTION OF A NEW SPECIES OF SNAKE FROM CLARION ISLAND, WEST COAST OF MEXICO.

By LEONHARD STEJNEGER,

Curator, Division of Reptiles and Batrachians.

When exploring the islands off and around Lower California in the spring of 1897, Mr. A. W. Anthony also visited Clarion Island, the most westerly of the Revilla Gigedo group, a small island situated about 400 miles southwest from Cape St. Lucas, Lower California. In addition to the *Uta* described from the same locality he collected quite a series of a new species of *Bascanion*, which I take pleasure in naming in honor of its discoverer.

BASCANION ANTHONYI, new species.

Diagnosis.—Scales in 17 rows; ventrals, 186–204; caudals, 97–112; frontal, at a line between centers of eyes, much narrower than supraocular; supralabials 8, fourth and fifth entering eye; a subocular; interparietal suture much shorter than distance from tip of snout to frontal; color above walnut brown, more or less uniform, and with scattered black spots.

Type.—Cat. No. 24390, U.S.N.M., Clarion Island. A. W. Anthony, collector.

Habitat.—Clarion Island, Revilla Gigedo group, west coast of Mexico.

Description of type specimen.—*Adult male:* Snout rather prominent, the tip extending considerably beyond the lower mandible; part of rostral visible above nearly equals the length of internasal suture, which is about one-half the length of the interprefrontal suture; frontal separated from preoculars, long and narrow, its greatest width anteriorly equaling that of the supraoculars; its width, at a line between the centers of the eyes much narrower than the width of the supraoculars at the same line; its length equals its distance from the tip of snout and is longer than parietals; supraoculars large, broadly in contact with prefrontals; parietals very short, their length less than frontal and less than twice the length of the interprefrontal suture; interparietal suture much shorter than distance from tip of snout to frontal, equaling interprefrontal and internasal sutures together; loreal rather large, longer than high; one preocular, narrow below and with a very prominent canthal ridge above; a rather large subpreocular; two postoculars; temporals, 2–2–2; eye very large, its horizontal diameter equaling its distance from the nostril, and two-thirds the length of the frontal; 8 supralabials, seventh and eighth subequal and largest, fourth and fifth entering eye; 7 lower labials, four in contact with anterior pair of chin-shields; posterior pair of chin-shields about the same length as anterior pair but considerably narrower; scales in 17 rows, smooth, with two apical pits; ventrals obtusely angulate laterally, 194; anal divided; subcaudals 112. Color above walnut brown, deepest toward the tip of each scale, and with blackish brown narrow linear spots, never longer than a scale, sparsely and irregularly scattered over the back and sides; head more uniformly pale walnut brown with a few irregularly scattered blackish dots, and a few obscure dusky marblings on lores and labials; under side pale, sprinkled irregularly with slate-colored dotlets, which toward the head become more pronounced and collected as two parallel longitudinal zones; chin and throat more definitely but irregularly marked with larger spots of the same color.

Dimensions.—Total length, 1,450 mm.; tail, 360 mm.

Variation.—In a much younger specimen, Cat. No. 24383, U.S.N.M., about 820 mm. in length, the coloration above is more grayish and entirely uniform, without the blackish spots; the under side is also uniform pale, with no markings except a few dusky dots on the neck; the sides of the head are brownish like the top, with the indication of a dusky longitudinal band on the upper half of the supralabials; the lower part of the latter as well as throat yellowish; preoculars and postoculars, together with a band from the former to the nostril, likewise yellowish. In this specimen the parietals are slightly larger in proportion and the frontal wider.

In some of the other specimens, intermediate in size between the two specimens mentioned, the dark markings on the chin, throat, and fore neck are very pronounced and the dusky mottlings on the rest of the underside very dense, only leaving a pale line on the angle of the belly, while in others they are condensed into two fairly distinct parallel longitudinal bands with a pale zone down the middle of the body.

Remarks.—In general appearance this species presents closer analogy to younger specimens of the eastern typical form of *Bascanion flagellum* than to *B. flagellum frenatum*, though showing indications of the peculiar facial pattern of the latter. It is, however, well differentiated by the very short parietals, large prefrontals, long rostral as seen from below, and larger eyes.

List of Specimens of Bascanion anthonyi.

U. S. N. M. No.	Sex and age.	Locality.	From whom received.	Ventrals.	Caudals.	Remarks.
24382	Male adult	Clarion Island	A. W. Anthony	186	....	
24383	Young	do	do	204	107	
24384	Male adult	do	do	192	....	
24385	Female adult	do	do	189	97	
24386	Female adult	do	do	187	105	
24387	Female adult	do	do	193	98	
24388	Female adult	do	do	196	109	
24389	Female adult	do	do	191	....	
24390	Male adult	do	do	194	112	Type.
24391	Female adult	do	do	194	....	
24392	Male adult	do	do	187	....	
24393	Female adult	do	do	190	....	
24394	Male adult	do	do	189	....	

ON THE RELATIONSHIPS OF THE LUTIANOID FISH, APHAREUS FURCATUS.

By David Starr Jordan and Edwin Chapin Starks,

Of the Leland Stanford Junior University.

A single specimen of the rare Lutianoid fish, *Aphareus furcatus*, 23 inches in length, was obtained by Dr. Kakichi Mitsukuri at Odawara, on Sagami Bay, in Japan. It was presented to the Museum of Stanford University by the Imperial University, with the label "Unknown fish from Odawara."

The specimen differs from the published descriptions in having the jaws absolutely toothless, but the specimens from which the descriptions were taken were small, and the teeth are doubtless deciduous.

APHAREUS FURCATUS.

(Plate XXVIII.)

Head $3\frac{2}{5}$ in length; depth $3\frac{3}{5}$. Dorsal X, 11; Anal III, 8. Scales 9, 72, 15. Eye $5\frac{1}{2}$ in head; snout $2\frac{6}{7}$; maxillary $1\frac{7}{8}$.

Body moderately elongate and compressed, tapering to a rather long caudal peduncle. Head large, slightly concave above eye; snout pointed. Lower jaw produced, its end squarish with the lower angle anterior to upper. Mouth large, somewhat oblique. Edges of jaws very slightly roughened anteriorly, but no teeth are present. Vomer and palatines toothless. Maxillaries scarcely protractile; upper edge covered by preorbital nearly to posterior end. Nostrils close together, placed about half an eye's diameter anterior to eye. Longest gill-rakers about equal to diameter of eye. Their number is 17+34.

Top of head, suborbital ring, preorbital maxillaries, lower jaw naked. Preopercle, upper part of clavicle, exposed portion of supraclavicle, and a Y-shaped tract at temporal region following supratemporal sensory canals naked. Scales all cycloid. Opercles and subopercles entirely scaled and cheeks with about seven rows of scales; a patch of scales at temporal region; scales of back extending forward to occiput. Lateral line concurrent with dorsal outline. No scales on fins, except a few on base of pectoral and much crowded rows covering base of caudal rays and extending between rays from where they branch nearly to their tips.

Dorsal fin without notch between spinous and soft parts. First dorsal spine about a third the height of the second. Third, fourth, and fifth about equal, the spines thence growing slightly shorter, the tenth about equaling the second. First dorsal ray articulated but not branched. Its height slightly less than that of last spine. The rays thence growing slightly shorter to before the last, which is at least (its tip is broken) twice as long as preceding one. First anal spine less than a fourth the height of the second and third, which are subequal. The rays about equal in height to the dorsal rays; the last ray about two and a half times the preceding one. Pectoral long and falcate. Its tip reaching to below base of first dorsal rays. Its lower rays produced, making its posterior outline very concave, more acutely curved below. Distance from tips of ventrals to front of anal half eye's diameter less than their length. Caudal widely forked.

Color of old alcoholic specimen somewhat silvery, darker on back, slightly iridescent toward head. Naked areas of head seal brown. Upper edge of mandible, a space back of maxillary, and border of preorbital darker. Dorsal dusky anteriorly, light posteriorly. Other fins colorless.

Measurements of Aphareus furcatus.

Length without caudal expressed in millimeters	480
Head expressed in hundredths of length	31
Depth	28
Eye	5¼
Maxillary	16¼
Height of fourth dorsal spine	11
Height of second anal spine	5
Length of pectoral	28¼
Length of ventrals	16½
Length of caudal fin, about (broken)	24
Length of caudal peduncle	22½
Distance from tip of snout to first dorsal spine	36
Number of dorsal rays	X, 11
Number of anal rays	III, 8
Scales	9, 72, 15

We have skeletonized one side of our specimen and find that its osteology seconds the external characters in showing its position to be in the family Lutianidæ. It has the characters indicated by Dr. Theodore Gill for that family. "The absence of distinct tubercles from the cranium for the articulation of the epipharyngeal bones, the development of enlarged apophyses for articulation with the palatine and preorbital bones, and the atrophy of parapophyses of the anterior vertebræ. The parapophyses may be said to be absolutely wanting on the anterior four vertebræ, and but faintly developed on the fifth and sixth, or even seventh."

The supraoccipital and lateral crests not extending over the interorbital region places *Aphareus* with that section of the family to which *Aprion* and *Etelis* belong. It shows its affinity to *Aprion* in having a continuous dorsal with the last rays of the dorsal and anal filamentous, and in having the alisphenoids attached medially restricting anterior opening to the brain case to a narrow space above them between two descending wings from the frontals, and a foramen behind them in front of the basisphenoid. *Aphareus* more closely resembles *Etelis* in the character of the periotic region, it being "little convex, and with the bones thick and unpolished."

THE SKELETAL CHARACTERS OF APHAREUS FURCATUS IN DETAIL.

Vomer toothless; at the anterior end somewhat trilobate; the middle portion rounding upward while the lateral parts recurve backward and downward.

Ethmoid wider than deep with the usual median ridge little developed.

Prefrontals heavy, swollen, with the articular fascets for the palatine and preorbital well developed, and with the usual foramen for the passage of the olfactory nerve. They scarcely touch each other posteriorly, there being much cartilage interposed between them and above and below.

Frontals thick and sculptured with fine tracing much as in *Lutianus aya*.

Behind projection on sphenotic to which suborbitals attach is an unusually deep socket into which the rounded anterior part of hyomandibular head fits.

Parietals widely separated by supraoccipital, and with a well-developed crest.

Epiotic developed into an acute point, but not extending backwards as a shelf. Over it lies the upper limb of post temporal.

Supraoccipital crest rising well upwards. Anteriorly not extending beyond supraoccipital. Posteriorly extending well back and merging imperceptibly into ligamentous tissue.

Basioccipital, prootic, pterotic, and opisthotic typical. To the last, lower limb of posttemporal attaches by ligament.

Parasphenoid wide under myodome. Laterally sending processes about half way up prootics. Posteriorly ending in two points and inclosing three sides of the rectangular opening into myodome.

Basisphenoid developed downward and backward as a spine. A thin lamella of bone developed from its anterior edge reaching to the parasphenoid.

Exoccipitals meeting above and below foramen magnum entirely surrounding it.

Alisphenoids particularly large, attaching suturally to each other, and restricting the anterior opening to the brain case to a narrow slit above them between two descending wings from the frontals, and to a very small semicircular opening below them, which latter is not nearly so large as foramen magnum.

Myodome wide anteriorly and little longer than wide. Opening to exterior posteriorly.

Hyomandibular sending a very long process downward to symplectic, which latter bone is almost hidden by the quadrate. The typical foramen between the upper edge of the metapterygoid and hyomandibular and guarded by a wing from the former bone is here almost absent. Otherwise the shape, size, and arrangement of the elements which make up the suspensorium is typical.

Opercular apparatus showing no departure from the usual percoid arrangement.

Nasal a very large thin wide bone, which attaching to frontal behind, to epiotic along inner edge, and its outer edge curving downward roofs over a large chamber in which the olfactory organs lie.

Supratemporal a widely forked thin tunnel of bone. Its inner branch arching over the skull to frontal, its outer continuous with sensory canal along edge of pterotic.

Preorbital large, extending over maxillaries. Suborbitals with a well developed inner shelf.

Shoulder girdle showing no peculiarities. Post-temporal widely forked; attached to skull by ligaments; hypercoracoid with a foramen through its center; actinosts four, graduated; postclavicle with both elements very wide and thin.

Four branchiostegals on the ceratohyal; three on the epihyal.

Interhyal short and with a rounded head which curves in between hyomandibular and symplectic.

Basibranchials two in number. Hypobranchial of fourth arch lacking as usual. Inferior pharyngeals long and slender, separate, and covered with small, curved, cordiform teeth. Four superior pharyngeals present on each side. The first or suspensory pharyngeal is styliform and toothless as usual; second, bearing an irregular row or recurved cordiform teeth; third and fourth large, united at bases, though not ankylosed, and bearing large, roundish, and separated patches of similar teeth.

Angular present, small.

Maxillaries without supplementary bones, processes from upper part of premaxillaries very short.

Dental surface of jaws slightly roughened anteriorly, but no teeth present.

Pelvic girdle typical; firmly attached between clavicles.

Vertebræ 10 + 13 + hypural = 24. Parapophyses not developed on four anterior vertebræ; a rudimentary one on fifth, thence growing longer posteriorly. Inferior and superior zygapophyses well developed.

Epipleurals present, none on centræ of vertebræ.

Interspinous bones typical; each with a transverse longitudinal lamella of bone, best developed anteriorly. Three supplementary interneurals present anteriorly. The first interhæmal not differentiated or much enlarged.

EXPLANATION OF PLATES.

SIGNIFICANCE OF REFERENCE LETTERS USED ON PLATES.[1]

als.	Alisphenoid.
bas.	Basisphenoid.
bo.	Basioccipital.
e.	Ethmoid.
eo.	Exoccipital.
epo.	Epiotic.
fr.	Frontal.
opo.	Opisthotic.
p.	Parietal.
pas.	Parasphenoid.
pf.	Prefrontal.
pro.	Prootic.
pto.	Pterotic.
so.	Supraoccipital.
spo.	Sphenotic.
v.	Vomer.

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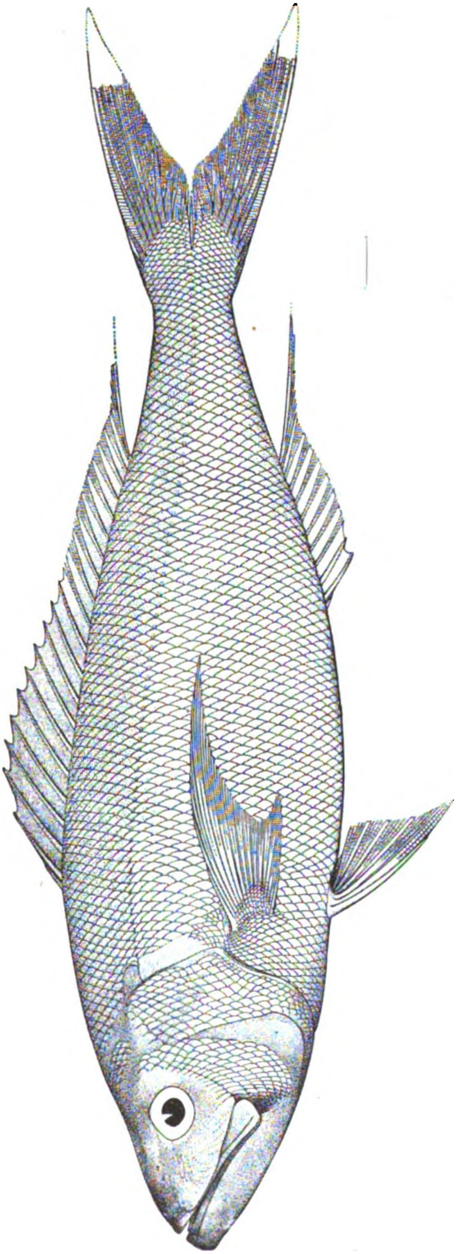
[1] The plates are from drawings made by Chloe Lesley Starks, Artist of the Hopkins Seaside Laboratory.



ALPHAREUS FURCATUS.

FOR EXPLANATION OF PLATE SEE PAGE 719.

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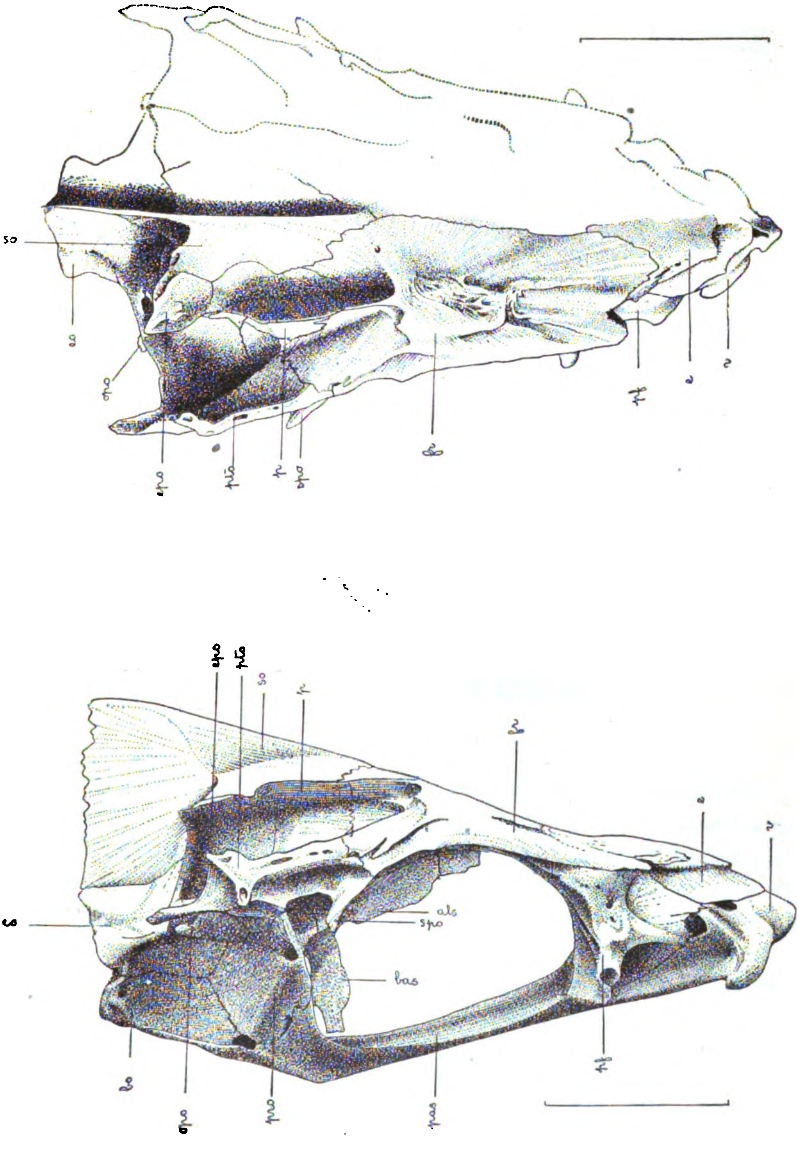

CRANIA OF ALPHAREUS FURCATUS.

FOR EXPLANATION OF PLATE SEE PAGE 723.

UNIVERSITY OF CALIFORNIA

A REVIEW OF THE LANCELETS, HAG-FISHES, AND LAMPREYS OF JAPAN, WITH A DESCRIPTION OF TWO NEW SPECIES.

By David Starr Jordan and John Otterbein Snyder,

Of the Leland Stanford Junior University.

In the present paper is given an account of the *Leptocardii* and *Marsipobranchii*, lancelets, hag-fishes, and lampreys, known to inhabit the waters of Japan. It is based on material collected by the writers in Japan, in the summer of 1900, under the auspices of the Hopkins Laboratory of Stanford University. Series of the species named are deposited in the U. S. National Museum.

Class LEPTOCARDII.

THE LANCELETS.

Skeleton membrano-cartilaginous. Notochord persistent and extending to the anterior end of the head, inclosed in a membranous sheath as is the cord-like nervous axis above it. Heart a longitudinal tubular vessel which gives off branchial vessels which unite in an aorta; end of the nervous axis not dilated into a brain and not surrounded by a protective capsule, or skull. Blood colorless. Respiratory cavity confluent with the cavity of the abdomen; gill slits in great number, the water being expelled through an abdominal pore in front of the vent. Jaws none; the mouth a longitudinal fissure, with cirri on each side. Body lanceolate in form, more or less fish-like, and not enveloped in a tunic. Dorsal fin present, low; anal fin usually more or less developed.

Small marine animals, highly interesting to the zoologist as exhibiting the lowest degree of development of the vertebrate type. The class includes but the single order, *Amphioxi* or *Cirrostomi*. (λεπτός, thin; καρδία, heart.)

Proceedings U. S. National Museum, Vol. XXIII—No. 1233.

Order AMPHIOXI.

THE CIRROSTOMES.

This order is equivalent to the family *Branchiostomidæ.* (ἄμφι, both: ὀξύς, sharp: *Cirrostomi* is from *cirrus*, a lock of hair; στόμα, mouth.)

Family I. BRANCHIOSTOMIDÆ.

THE LANCELETS.

Body elongate, lanceolate, compressed, naked, colorless; the fins represented by a low fold extending along the back, with usually a rudimentary fold below which passes by the vent to the abdominal pore. Mouth inferior, appearing as a longitudinal fissure, surrounded by conspicuous, rather stiff, cirri. Eye rudimentary. Liver reduced to a blind sac of the simple intestine. Small, translucent creatures found embedded in the sand on warm coasts throughout the world. The species are all very similar in appearance and habits, and the numbers of the muscular impressions furnish the only characters thus far known by which the species can be distinguished.

a. Gonads (reproductive structures) present on both sides of the median line; anal fin present with traces of fin rays; no caudal process .... BRANCHIOSTOMA, 1

1. BRANCHIOSTOMA Costa.

Branchiostoma COSTA, Cenni Zoologici Napol., 1834, p. 49 (*lumbricum=lanceolatum*).

Amphioxus YARRELL, British Fishes, 1836, p. 468 (*lanceolatus*).

Lancelets with the gonads or reproductive structure present on both sides of the median line. Anal fin present, with traces of rays. Vertebral column not produced backward into a caudal process. Six or seven species recognized, found in the warm seas, usually buried in sand flats at no great depth. They are very tenacious of life, and will endure considerable mutilation. (βράγχια, gills; στόμα, mouth—the cirri about the mouth having been taken for gills by Costa.)

a. Myocommata or muscular bands, 62 to 64.
  b. Myocommata behind vent, 10 or 11, the formula usually 37 + 16 + 11 = 64 .... NAKAGAWÆ, 1

1. BRANCHIOSTOMA NAKAGAWÆ Jordan & Snyder, new species.

Amphioxus sp. ANDREWS, Zool. Anzeiger, 1895, p. 468, Goshi-no-ura, Amakusa, Buzen.

Amphioxus sp. NAKAGAWA, Annot. Zool. Jap., I, 1897, p. 127. Goshi-no-ura in Higo, Shikajima in Chikuzen.

Muscular bands, 37 + 16 + 11 = 64. Usual length, 1 to 2 inches. Body relatively long, the tail short, the form rather stout. Sandy coasts of Japan, from Misaki southward to Kiusiu, our specimens from Misaki, presented by Dr. Mitsukuri. Others in Imperial University collected at Bungo by Dr. S. Matsubara, at Shikajima, by Dr. S. Hatta, and at Misaki (Koájiro Bay) by Dr. H. Nakagawa. Dr. Ethan A. Andrews further records specimens from Goshinoura, Amakusa, and Buzen, in Kiusiu. Dr. Andrews, on specimens from Kiusiu, counts the muscular bands as $37 + 16 + 11 = 64$. On the type specimen from Misaki, very carefully counted for us, by Dr. Nakagawa, in the Imperial University, the following numbers were found in a specimen of 45.5 M.

Right side, $37 + 16 + 10 = 63$.
Left side, $37 + 16 + 11 = 64$.

The specimens from near Misaki were taken in Koájiro Bay, just north of Misaki, by the veteran collector, Kumakichi Aoki, of Misaki.

The Japanese lancelet is very closely allied to *Branchiostoma belcheri* (Gray), (*Amphioxus belcheri* Gray),[1] from Bass Straits. According to Dr. Günther, the types of this species have the muscular bands $37 + 14 + 13$, the tail longer and the body shorter than in the Japanese form. It is possible that this difference is due simply to errors in counting. In view, however, of the almost entire difference in species in the shore fauna of Japan and that of Borneo, it seems to us best to regard the Japanese lancelet as a species distinct from *B. belcheri*. It needs comparison with no other.

Named for Dr. H. Nakagawa, of Tokyo, well known as an entomologist, in recognition of his excellent work on the present species.

Class MARSIPOBRANCHII.

THE MYZONTS.

Skeleton cartilaginous; the skull imperfectly developed, not separate from the vertebral column. No true jaws, no limbs, no shoulder girdle, no pelvic elements, no ribs. Gills in the form of fixed sacs, without branchial arches, six or more in number on each side. Nostril single, median. Mouth subinferior, suctorial, more or less circular. Heart without arterial bulb. Alimentary canal straight, simple, without cæcal appendages, pancreas, or spleen. Generative outlet peritoneal. Vertical fins with feeble rays, usually continuous around the tail. Naked, eel-shaped animals, inhabiting cool waters, both fresh and salt. They undergo a metamorphosis, the young being often quite unlike the adult. (*μαρσίπιον*, pouch; *βράγχια*, gills.)

ORDERS OF MARSIPOBRANCHII.

a. Nasal tube duct-like, with cartilaginous rings penetrating the palate; gill openings remote from the head, opening directly into the pharynx; no eyes. *Hyperotreti*

aa. Nasal duct a blind sac, not penetrating the palate; gill openings close behind the head, communicating with a common branchial passage which opens directly into the pharynx; eyes well developed in the adult .... *Hyperoartii*

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[1] Proc. Zool. Soc. London, 1847, p. 35.

Order HYPEROTRETI.

THE HAGFISHES.

Nostril tube-like, with cartilaginous rings, penetrating the palate, its position at the extremity of the head, over the mouth; snout with eight barbels; mouth without lips; one median tooth on the palate and two comb-like series of teeth on the tongue. Branchial apertures at a great distance from the head; a series of mucous sacs along each side of the abdomen. Intestine without spiral valve. Eggs large, with a horny case provided with threads for adhesion. Marine lamprey-like animals, burrowing into the flesh of fishes, on which they feed. They may be referred to two families, differing mainly in the structure of the gill openings. (ὑπερώα, palate; τρητός, perforate.)

a. Branchial apertures six to fourteen on each side, each leading by a duct to a branchial sac...*Eptatretidæ*

aa. Branchial apertures single on each side, from which diverge ducts to six branchial sacs...*Myxinidæ*

Family II. EPTATRETIDÆ.[1]

This family differs from the *Myxinidæ* chiefly in the structure of the branchial apparatus, there being six to fourteen sacs on each side which receive water directly from the esophagus, as in *Myxine*, but the emptying ducts, instead of passing backward and downward to a common external opening, as in *Myxine*, pass directly through the wall of the body, so that there are as many external openings as there are gill sacs. Species few, inhabiting the colder parts of the Pacific, their habits similar to those of *Myxine glutinosa*.

The hagfish fastens itself usually on the gills or isthmus of large fishes, sometimes on the eyes, whence it works its way very rapidly into the inside of the body. It then devours all the flesh of the body without breaking the skin, so that the fish is left a living hulk of head, skin, and bones. It is especially destructive to fishes taken in gill nets. In gill nets, in summer, these empty shells of fishes are often obtained. When these are taken from the water, the hagfish scrambles out with great alacrity. It is thought that the hags enter the fishes after they are caught. A fish of 10 to 15 pounds weight will be devoured by them in a single night.

a. Gill openings six to eight on each side...............................*Eptatretus*, 2

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[1] We adopt the name *Eptatretus* instead of *Homea* in deference to the argument of Professor Gill in the following paper.

2. EPTATRETUS Duméril.

Eptatretus (Duméril) CLOQUET, Dict. Sci. Nat. XV, 1819, p. 134 (*dombeii* Duméril, not Lacépède).
Homea FLEMING, Philos. Zool., II, 1822, p. 374 (*banksi*).
Les Heptatrèmes DUMÉRIL, Cuvier Règne Anim., 2d ed., II, 1829, p. 405 (*cirrhatus*).
Heptatremes (Duméril) M'MURTRIE, Anim. Kingdom, II, 1831, p. 298 (*cirrhatus*).
Heptatrema VOIGT, Das Thierreich, II, 1832, p. 529 (*cirrhatus*).
Bdellostoma MÜLLER, Abh. Ak. Wiss., Berlin, 1834 (*hexatrema*).
Heptatremes GRIFFITH, Animal Kingdom, X, 1834, p. 621 (*cirrhatus*).

This genus includes those *Eptatretidæ* which have six to eight gill openings, thus differing from the West American genus, *Polistotrema*, which has from ten to twelve.

2. EPTATRETUS BURGERI (Girard).

NUTAUNAGI OR SLIME-EEL.

(Plate XXX.)

Heptratema cirrhatum SCHLEGEL, Fauna Japonica, Poiss., 1847, p. 310, pl. CXLIII, Nagasaki (not *Petromyzon cirrhatus* Forster, from South Africa).
Bdellostoma cirrhatum ISHIKAWA, Cat., 1897, p. 63, Coast of Musashi (off Tokyo).
Bdellostoma burgeri GIRARD, Proc. Ac. Nat. Sci. Phil., 1854, p. 199, after Schlegel.

Snout 6 to 6⅔ in distance to first gill opening; gill area, with six openings, somewhat longer than snout; last gill opening on the left side double the size of the others; eye well developed; head, to gill opening, 3⅓ to 3⅔ in length of body; barbels, eight, the outer buccal barbels longest 2 to 2⅔ in snout; inner short and thick; nasal barbels long, much longer than labrum, the lower longest; teeth in upper row about 11 in number; tip of snout or labrum very broadly rounded; its width greater than length of upper barbel; dorsal and anal fins spreading widely on the tail; greatest breadth of tail with fins one and one-half times length of snout; tail, from vent, 2⅓ in head, from gill opening.

Color purplish or plum color, the belly a little dorsal, and anal darker, conspicuously edged with pale; a pale ridge about middle line of back; barbels pale; row of slime pores distinct along whole length of body.

Coasts of Japan, from Tokyo southward, not rare. Here described from three large examples, the largest 18½ inches long, from Sagami Bay (off Misaki and off Enoshima), and from one about a foot in length from Wakanoura. In all these the number of gill openings is six on each side. The specimen from Wakanoura has the snout very much shorter than either of the others, the outer buccal barbel reaching within half its length of the eye, almost a whole length short in the others. No other important differences appear, and probably this is within the range of individual variation. It is barely probable that the specimen from Wakanoura, with the short snout, may belong to a distinct species. In general, the example figured by us (from off Enoshima; Collection of U. S. Fish Commission steamer *Albatross*) agrees with Schlegel's plate.

With the species of *Myxine*, this species is known to the Japanese fisherman as *Nutaunagi*, or slime-eel. The two species are alike in size, color, and habit. *Eptatretus burgeri* may be known by the presence of six gill openings on each side, instead of one, by the very blunt upper lip or tip of snout, and by the paler edges to the fins. The eye is much more distinct than in *Myxine*.

Named for its discoverer, Bürger, who collected for Siebold and Schlegel.

Family III. MYXINIDÆ.

Body eel-shaped, covered by a thin skin, which is easily detached. Along the lower side, for nearly the whole length of the animal, are two rows of mucous glands, each with an external opening, yielding an abundance of mucus, which renders these animals excessively slimy. No eyes. Brain small, of the normal fish type. Skull little developed, cartilaginous; the flexible notochord inclosed in its sheath and extending from the base of the skull to the end of the tail, representing the spinal column. Mouth round, suctorial, without lips, with a few barbels on each side. Nostril single, large, on the median line above, and at the very front of the head, provided with two pairs of barbels. Teeth strong, a single median one on the roof of the mouth, and two rows on each side of the tongue, which is a powerful organ, with a strong, fibrous tendon moving in a muscular sheath. Alimentary canal a simple, nearly straight tube, without spiral valve; gill sacs placed on each side of the œsophagus, lying directly against its outer walls. The water passes into them by a small pore opening directly from the œsophagus into each sac. It is then passed out by a duct, which continues backward along the outer walls of the sacs to the abdominal wall at the end of the last sac, where all the ducts from one side unite into one, and the water is emptied at the branchial opening on each side of the median line. In close connection with the branchial opening on the left side there is a third opening that leads by a very short duct to the œsophagus, and hence into the branchial sacs, at the times when the supply of water is cut off by the head being buried in the flesh of the animal on which it feeds. Vent close to tip of tail. Ovary single, on the right side. No oviducts; the mature eggs falling into the abdominal cavity and excluded through the peritoneal opening at the side of the vent. Eggs with a horny case, and threads for adhesion. Parasitic animals, burrowing into the bodies of fishes, and found in the cold seas. One genus, with several species, found in most cold seas.

3. MYXINE Linnæus.

Myxine LINNÆUS, Systema Naturæ, 10th ed., 1758, p. 650 (*glutinosa*).
Gastrobranchus BLOCH, Ichth., XII, 1797, p. 51, pl. CCCCXIII (*cœcus*).
Murænoblenna LACÉPÈDE, Hist. Nat. Poiss., V, 1803, p. 647 (*olivacea*).
Anopsus RAFINESQUE, Anal. de la Nature, 1815, p. 493 (*olivacea*).

Characters of the genus included above.

(An old name, from μύξα, slime.)

3. MYXINE GARMANI Jordan and Snyder, new species.

Myxine australis GÜNTHER, Challenger Fishes, 1887, p. 267, not type, Hyalonema Ground off Enoshima.
Myxine sp. GARMAN, Deep Sea Fishes, 1900, p. 345.

Teeth in upper series ten in number; the anterior three confluent at base but not enlarged, rather narrow and not longer than the next teeth; labrum or tip of snout above narrowly triangular, pointed at tip, resembling the barbels, and scarcely shorter than the barbel standing next; pectoral pores about thirty; nasal barbels well developed, the upper somewhat shorter; buccal barbels prominent, the inner pair short and thick, the lower longer than the rostral barbels. Gill openings moderate, inserted a little before end of first third of body; vent a little before middle of dorsal fin; anal scarcely as deep as borsal.

Color dark purplish brown or plum color, slightly paler below; barbels pale; dorsal and anal not edged with paler, no pale ridge along back.

Described from three specimens, the largest 19½ inches long, in fine condition, the others injured, all taken off Misaki, where the species is rather common.

It was first noticed by Dr. Günther who had half a dozen specimens from the Hyalonema grounds off Enoshima, at a depth of 345 fathoms. Dr. Günther identifies these specimens with *Myxine australis* Jenyns, from Patagonia, and further "believes" on rather scanty evidence "that *Heptatrema cirrhatum* of Schlegel (*Eptatretus burgeri*) should be referred to the same species."

As to this Mr. Garman very properly observes: "The results of comparisons of representatives of the genus from other parts of the world are such as to raise doubts concerning the specific identity of the Japanese species with either of the species of *Myxine* from other regions."

The Japanese form is in fact distinct, allied to *M. tridentiger* Garman, from Sandy Point, Patagonia, in its dentition, and to *M. acutifrons* Garman, from the same region, in the form of its labrum, or front of snout.

Named for Samuel Garman, of Harvard University, in recognition of his excellent work on the species of Myxine.

Order HYPEROARTII.

THE LAMPREYS.

Nasal duct a blind sac, not penetrating the palate. This order is equivalent to the single family *Petromyzonidæ*. (ὑπερῴα, palate: ἄρτιος, complete; i. e., entire.)

Family IV. PETROMYZONIDÆ.

(THE LAMPREYS.)

Body eel-shaped, subcylindrical anteriorly, compressed behind; the mouth nearly circular, suctorial, usually armed with horny teeth, or tooth-like tubercles which are simple or multicuspid resting on papillæ; those immediately above and those immediately below the œsophagus more or less specialized; eyes developed in the adult; gill openings 7, arranged in a row along the sides of the "chest;" nostril on top of the head just in front of the eyes; lips present, usually fringed; dorsal fin more or less deeply divided by a notch; the posterior part commonly continuous with the anal around the tail; intestines with a spiral valve; eggs small.

These animals undergo a metamorphosis; the young are usually toothless and have the eyes rudimentary. Separate generic names (*Ammocœtes*, *Scolecosoma*, *Chilopterus*) had been applied to these larval forms before it was discovered that they were the normal young of the true lampreys.

The lampreys inhabit rivers of temperate regions. They attach themselves to fishes and feed by scraping off the flesh with their rasp-like teeth. Most of them ascend rivers or brooks at the spawning season, after which very many of the individuals die.

a. Second dorsal continuous with caudal.
  b. Supraoral and infraoral laminæ with teeth or tooth-like tubercles.
    c. Supraoral lamina very large, expanded laterally, forming a crescent-shaped plate with a cusp at either end and rarely a very small median cusp; anterior lingual tooth little developed, its edge crescent-shaped and dentate, the middle denticle enlarged; buccal disk small, the lateral teeth small and never tricuspid; dorsal fins separate or united at base; small lampreys; fluviatile. *Lampetra*, 4.

4. LAMPETRA Gray.

Lampetra Gray, Proc. Zool. Soc. London, 1851, p. 235 (*fluvialis*).

Lampreys of small size, with the dorsal fin emarginate, or divided into two parts, the posterior portion continuous with the low anal fin around the tail; supraoral lamina broad, forming a crescentic plate, with a large bluntish cusp at each end, and rarely a very small median cusp; lingual teeth small, with a crescent-shaped dentate edge, the median denticle enlarged; buccal disk small, its teeth few and never tricuspid. Small lampreys inhabiting the brooks of Europe, Asia, and North America.

a. Dorsal fin divided into two parts, separate or joined at base only; infraoral lamina with 6 to 8 sharp cusps .... *japonica*, 4

aa. Dorsal fin distinctly continuous, but with a sharp notch; infraoral lamina with 6 to 7 blunt cusps .... *mitsukurii*, 5

4. LAMPETRA JAPONICA (Von Martens).

YATSUMEUNAGI (EIGHT-EYED EEL).

Petromyzon japonicus MARTENS, Archiv. Naturg., XXXIV, 1868, p. 3; Japan.

Petromyzon fluviatilis ISHIKAWA, Prel. Cat., 1897, p. 63, Yamagata, Niigata, Takata, R. Shimigu, Totomi, Owari, Kioto, Uji in Yamashiro, Lake Biwa at Nagahama in Omi, Hatta, Lampreys of Japan. Rivers of southern Hondo. (Not of Linnæus.)

Supraoral lamina forming a long, crescentic plate, with a sharp cusp at either end; no median cusp; infraoral lamina with seven (six to eight) sharp cusps, which are nearly equal, except that the outer is much broader than the others; lateral teeth, three on each side, each with two cusps; tongue with nine cusps, the median much the largest; lips fringed; two rows of simple teeth in front of mouth above. Dorsal fins entirely separate, the first not quite half the height of the second, the interspace $2\frac{1}{6}$ in head; $2\frac{3}{4}$ in length of first dorsal. Gill openings, 7; head, $1\frac{1}{10}$ in thorax; snout, $1\frac{3}{4}$ in head; head, 10 in total length; greatest depth, $1\frac{3}{8}$ in head. Tail, $4\frac{1}{4}$ in total length. Blackish; paler below; tail darker; dorsals edged with pale.

Rivers of southern Hondo, north about to Niigata and Sendai, generally common. Here described from a specimen $18\frac{1}{2}$ inches long from Shinano River in Echigo. Other specimens obtained by us are from near Tokio (infraoral cusps six, the outer more enlarged); one from Noyshiro, six cusps; Noyshiro, eight cusps, the two outer coalescent on either side.

This species is very close to *Lampetra aurea* (Bean), of the Yukon River, and to *Lampetra fluviatilis* Linnæus, of the streams of Europe. Our material is not sufficient to show that it is really different from either or both of these. It is, however, very undesirable to unite nominal species from widely separated regions until identity is actually shown. This species seems to have a higher second dorsal than the European species. From Dr. Hatta's map of the distribution of lampreys in Japan, it is evident that the present species has a much more southerly range than the other. This would indicate that it is not identical with the lamprey of the Yukon. The species is known in Japan as Yatsumeunagi, or Eight-eyed Eel.

Lampetra ernstii (Dybowski) (Fischfauna des Amurgebietes, 1872, 220), from the mouth of the Amur, is also close to *Lampetra japonica*, but is said to have 19 denticles in a row across the tongue.

5. LAMPETRA MITSUKURII (Hatta).

Petromyzon branchialis ISHIKAWA, Prel. Cat., 1897, p. 63, Sapporo, Hokkaido.—HATTA, Lampreys of Japan, rivers of northern Japan (not of Linnæus).

Lampetra mitsukurii HATTA, Ms. based on *Petromyzon branchialis* Hatta, not of Linnæus.

Lampetra mitsukurii JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 336 (no description; young specimens from Tokio and Lake Biwa referred to by error: those belong to *L. japonica*);—JORDAN & SNYDER, Catal. Fish. Japan, 1901.

Supraoral lamina forming a crescentic plate, shorter than in *L. japonica*, the cusp at either end shorter and more obtuse; infraoral lamina with about six blunt cusps, the outer ones much broader and longer than the others; lateral teeth three on each side, each bicuspid and blunt, two or three rows of simple teeth in front of supraoral lamina; lips fringed.

Dorsal fins connected, the first two-fifths to one-third height of second, the connecting membrane of the two fins about one-third height of first. Head 1½ in first dorsal, about one-tenth longer than thorax; gill openings, 7; head, 9 in total length; tail, 4; 62 muscular impressions between gill openings and vent.

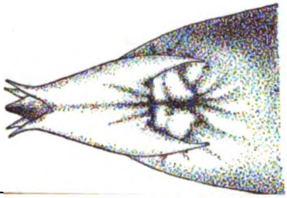
Color bluish-black, the belly white; tip of tail blackish; fins pale, edged with darker.

Rivers of Hokkaido, and Hondo north of Sendai and Niigata, generally common. Here described from eight specimens, one 5½, the others 12 to 14 inches in length, obtained from the Ishikari River, at Sapporo in Hokkaido. The smallest one has seven infraoral cusps and the teeth are less developed. It agrees in all other regards with the largest one.

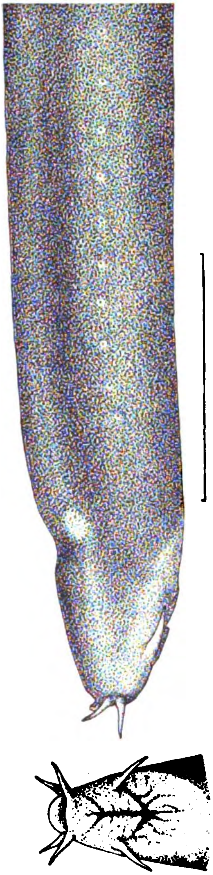
From the lampreys of southern Japan this species is at once distinguished by the united dorsals.

This species is related to *Lampetra wilderi* of the eastern United States, and still more closely to *Lampetra planeri* (Bloch) of Europe. It will require actual comparison of specimens to separate it from the latter, but our experience with other species in widely separated regions shows that it is very hazardous to assume identity of species simply because superficial and noncomparative descriptions indicate no difference. The Japanese species seems to reach a larger size and to have higher fins than the European.

Named for Professor Mitsukuri, of the Imperial University of Japan.



The upper illustration represents an under view of the head of *Myxine garmani*, for description of which see page 731.



EPTATRETUS BURGERI.

FOR EXPLANATION OF PLATE SEE PAGE 729.

THE PROPER NAMES OF BDELLOSTOMA OR HEPTATREMA.

By Theodore Gill,
Honorary Associate in Zoology.

The *Hyperotretes* with seven and six lateral branchial apertures have been generally designated of late years as the genus *Bdellostoma.* This name was proposed by Johannes Müller in 1834. Long before this name was proposed, however, no less than four others, or, including orthographical modifications, eight others, had been proposed for the same type. I have long used *Heptatrema*, but had casually referred to a name (*Homea*) proposed by Fleming. Mr. Garman, not knowing the original notices of the previous names, felt compelled to assume that *Homea* was the first published and adopted it. With laudable caution, however, he made the proviso that "unless it can be shown that there was use of the name *Heptatrema* previous to 1822 it will have to give way to *Homea*." President Jordan and Mr. Snyder had also adopted that name, but the alternative by no means follows. The real history of the nomenclature of the genus, therefore, seems to be urgently demanded and I now give the facts known to me for many years, but not published. Unfortunately the name *Heptatrema* will have to be given up, if the current view that the generic name must be clothed in a Latin garb is strictly adhered to.

I.

In 1818, Cloquet[1] gave an article on *Cyclostomes*, in which he summed up his conclusions in the following dichotomous table:

Famille des Cyclostomes.

Lèvres	tentaculées; trous des branchies au nombre de	deux, ventraux	Myxine.
		sept, latéraux	Eptatrême.
	sans palpes ni tentacules; bouche	dentée	Lamproie.
		sans dents	Ammocœte.

This is the first notice of *Eptatrême.* No genotype was mentioned.

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[1] Dictionnaire des Sciences Naturelles, XII, pp. 301–304.

II.

In 1819, Cloquet[1] published an article under the caption "*Eptatrème ou Eptatrète*" which may well be reproduced *in extenso*.

EPTATRÈME OU EPTATRÈTE (*Ichthyol*).

M. Duméril a donné ce nom à un genre de poissons de la famille des cyclostomes, et voisin par conséquent des lamproies et des myxines. Il lui assigne les caractères suivant:

Corps cylindrique, nu, visqueux; bouche tronquée, arrondie; lèvres tentaculées; sept trous latéraux pour les branchies.

A l'aide de ces notes on distinguera au premier coup d'œil les eptatrèmes des Lamproies et des Ammocètes, qui n'ont point les lèvres tentaculées, et des Myxines, qui n'ont, pour ouvertures des branchies, que deux trous ventraux. (Voyez ces mots et Cyclostomes.)

Le mot eptatrème est grec et signifie qui *a sept trous* (ἑπτὰ, *septem*, et τρῆμα, *foramen*). M. Duméril avoit d'abord proposé le mot *eptacitrète*, qui a la même valeur (ἑπτακις, *septies*, et τρητος, *perforatus*). On ne connoît encore qu'une espèce dans ce genre, c'est

L'Eptatrète Dombey, *Eptatretus Dombeii*, Duméril; le Gastobranche Dombey, Lacépède. Tête arrondie et plus grosse que le corps; quatre barbillons à la lèvre supérieure; dents pointues, comprimées, triangulaires et disposées sur deux rangs circulaires; l'extérieur est composé de vingt-deux de ces dents, et l'intérieur de quatorze seulement; une dent plus longue que les autres et recourbée, placée au milieu du palais; point de traces d'yeux; queue très-courte, arrondie à l'extrémité et terminée par une nageoire qui se réunit à celle de l'anus.

Ces deux nageoires sont les seules que l'animal présente; elles sont très-basses et très-difficiles à distinguer.

M. le comte de Lacépède, le premier, a fait connoitre cet animal curieux d'après une peau sèche qui avoit été apportée des mers du Chili par le célèbre voyageur Dombey. Mais il l'avoit placé dans son genre Gastobranche, à côté de la myxine, et nous avons fait voir, en en exposant les caractères, qu'il en différoit d'une manière notable.

Depuis cette époque, dans un Mémoire lu, le 1^er^ Juin 1815, à la Société royale de Londres, Sir Everard Home a donné la description des organes de la respiration de l'eptatrème, d'après un individu rapporté de la mer du Sud par Sir Joseph Banks. Ces organes, dit-il, resemblent à ceux de la lamproie pour le nombre des ouvertures extérieures et pour celui des sacs branchiaux; mais ils se rapprochent de ceux des myxines, en ce qu'il n'y a aucune apparence de thorax ni de péricarde cartilagineux; les sacs branchiaux eux-mêmes sont des sphéroïdes aplatis, disposés verticalement; leur cavité est petite; leurs parois sont élastiques, et leur orifice intérieur communique directement avec l'œsophage, qui est d'un fort petit calibre, et qui se termine par un repli membraneux lache et transversal.

L'Eptatrète a une narine postérieure et une espèce de luette, une vésicule du fiel, une rangée de glandes volumineuses de chaque côté de l'abdomen, et un intestin soutenu par un mésentère.

Les organes de la génération sont semblables à ceux de la lamproie.

Sir Everard Home pense, dans le Mémoire que nous venons de citer, que cet animal doit faire un genre particulier et distinct de celui des lamproies et des myxines. C'est à une époque où il ne pouvoit connoître le travail de l'auteur anglois, que M. Duméril établissoit à Paris son genre Eptatrème. (H. C.)

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[1] Dictionnaire des Sciences Naturelles, XV, pp. 134–136.

The question of nomenclature in this case has been complicated, not only by the diversity of names suggested, but also by the specification or naming of the type of the genus and the statement as to the establishment of the genus by Duméril.

The type was designated as being identical with the "*Gastrobranche Dombey*" of Lacépède. Now, the fish of Lacépède was a dried skin which did not show the branchial apertures (at least they escaped Lacépède's attention), and of course the data as to the number of branchial apertures and their structure could not been derived from that fish, but evidently, as was indeed confessed, were based on the dissections of Sir Everard Home. The species "*Eptatretus Dombeii* Duméril," of Cloquet was therefore a composite, the description of the dentition having been derived from Lacépède and the rest from Home. The *material part*, however, relative to the number and structure of the branchial apertures and pouches, *was due to Home.* The generic characters, in fact, were entirely derived from Home, and the specific name used was simply the result of a *misidentification*, it having been erroneously assumed that the species of Home was the same as that of Lacépède.

Cloquet's statement that Duméril had established the genus before he could have known of Home's article need not detain us or deter us from arriving at the only legitimate conclusion. Possibly Duméril might have thought or even perceived that there were lateral branchial apertures and given a name, but he could not have been certain of his premises till he had seen Home's work.

It will further appear that the only one of the three names imagined for this genus accompanied by a latin equivalent is *Eptatretus*. Much as I dislike to substitute that name for *Heptatrema* or *Heptatremus*, there is, I suppose, no alternative against it. Although the French equivalent of the latter name was especially framed for it from the Greek, that fact will be regarded by almost all American nomenclators at least insufficient, since it was used in French guise only. Both Duméril and Cloquet evidently intended to use *Eptatremus* but in their senseless maunderings failed to do so.

III.

In 1822, Fleming,[1] not knowing the work of his predecessors, proposed a new name, adding after "1. PETROMYZON," the following:

> 2. HOMEA. Margin of the mouth bearded.
>
> I have ventured to name this genus in honor of Sir Everard Home, who has so successfully investigated the aerating and reproductive organs of the tribe to which it belongs, and who has pointed out its distinguishing internal characters. The trivial name is due to the late illustrious Banks, by whom the species was brought to this country from the South Seas. *H. Banksii.*

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[1] Philosophy of Zoology, II, p. 374.

In a footnote to page 375, he reproduced the following remarks of Sir Everard Home:

> In an animal brought from the South Seas by Sir Joseph Banks, intermediate between the lamprey and myxine, but differing so much from both as to form a distinct genus, the respiratory organs resemble those of the lamprey in the number of external openings, and the number of bags; but these organs, and many other parts, differ in the following particulars, in which they agree with those of the myxine. There is no appearance, whatever, of thorax, nor is the pericardium cartilaginous; the bags are flattened spheres placed perpendicularly, their cavities are small, their coats elastic, and the internal orifices communicate directly with the œsophagus, which is small. The œsophagus does not terminate in a valvular slit, but in a loose membranous fold; there are two rows of teeth on each side of the tongue, bent downward, long, and pointed. There is a posterior nostril, and an appearance resembling an uvula. There is a gall bladder, a row of large mucous glands on each side of the belly, and there is a mesentery to the intestine. Phil. Trans. 1815, p. 258, pl. xii, fig. 1.

The first subsequent reference to this name *Homea* was by the present writer in 1894.[1] In connection with comments on Dr. Howard Ayers's views respecting the Bdellostomids and his preference for *Bdellostoma* over *Heptatrema*, because the species of that genus frequently deviate from seven in the number of pairs of gills, it was suggested that the name *Homea* was not open to that objection and, as it was long prior to *Bdellostoma*, might be used by Dr. Ayers and those who shared his views. Mr. Garman, however, has taken up the name for another reason, as already indicated at length.

The history of the genus may be briefed in the following synonymy:

EPTATRETUS.

Eptatrème Duméril fide Cloquet, Dict. Sc. Nat., XII, 1818, p. 304.
Eptatrème or *Eptatrète* Duméril fide Cloquet, Dict. Sc. Nat., XV, 1819, p. 134.
Eptatrètus Duméril fide Cloquet, Dict. Sc. Nat., XV, 1819, p. 135.
Eptacitrète Duméril fide Cloquet, Dict. Sc. Nat., XV, 1819, p. 135.
Homea Fleming, Phil. Zool., II, 1822, p. 374.
Les Heptatremes "Dumér." Cuvier, Régne An., n. ed., II, 1829, p. 405.
Heptatremus "Dumer." M'Murtrie, Animal Kingdom, II, 1831, p. 298.
Heptatrema Voigt, Thierreich, II, 1832, p. 529.
Heptatremes[2] Griffith, Animal Kingdom, X, 1834, p. 621.
Bdellostoma Müller, Abhandl. Akad. Wiss. Berlin, 1834.

In accordance with a generally accepted rule, the family name must be altered to accord with the facts. *Eptatretidæ* consequently will be the name for the family typified by *Eptratretus*.

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[1] American Naturalist, XXVIII, p. 584.

[2] Heptatremes is given as a regular Latin name.

LIST OF FISHES COLLECTED IN 1883 AND 1885 BY PIERRE LOUIS JOUY AND PRESERVED IN THE UNITED STATES NATIONAL MUSEUM, WITH DESCRIPTIONS OF SIX NEW SPECIES.

By David Starr Jordan and John Otterbein Snyder,

Of the Leland Stanford Junior University.

During the year 1883 the late Pierre Louis Jouy, then an assistant to the U. S. National Museum, visited Japan, making a small but very valuable collection of rare forms of fishes, many of which he obtained from the markets of Yokohama. During 1885, on his way to Korea, he also visited Sasuna, the port of the Japanese island of Tsushima, in the Straits of Korea.

In the present paper is given a list of the species collected in 1883 and 1885, with descriptions of new ones, accompanied by plates drawn by Mr. William Sackston Atkinson, Miss Lydia M. Hart, and Mrs. Chloe Leslie Starks. A few Japanese fishes from other sources contained in the U. S. National Museum are also mentioned. Comparisons have been made with specimens in the very large Japanese collections, as yet undescribed, made by the writers in 1900. The specimens mentioned are in the U. S. National Museum, a few duplicates being retained for the museum of Stanford University. The writers are under obligation to Mr. Richard Rathbun and to Mr. Barton A. Bean for many favors in connection with the study of this collection.

MEASUREMENTS.

The measurements given in the tables were made by means of dividers and a proportional scale. In some cases they will be of great value as an aid in discriminating between closely related species. It is believed also that they will show, in an approximately definite way, some of the variations of certain characters useful in the determination of relationships.

They are expressed in hundredths of the length of the body, which is measured from the tip of the snout to the end of the last vertebra.

The depth of the body is measured at its deepest part; depth of caudal peduncle at its narrowest place; length of caudal peduncle from base of last anal ray to end of last vertebra; length of head from tip of snout to posterior edge of opercle; length of snout from its tip to anterior margin of orbit; width of interorbital space measured on the skull, the dividers compressed tightly between the eyes; diameter of orbit, longitudinally; length of caudal fin from end of last vertebra to tip of longest rays. Only fully developed fin rays are counted. The rudimentary rays of dorsal and anal, when closely adnate to the first branched ray, are counted with it as one ray. When the soft dorsal contains a spine it is enumerated as a ray; when last ray of dorsal or anal is double it is counted as one. Scales in the lateral series are counted to base of caudal fin; transverse series from insertion of ventrals or anal, whichever is nearer middle of body, upward and forward; above or below lateral line, as indicated in the description.

The new species described are the following:

Leuciscus jouyi, Sasuna, Tsushima.
Apogon unicolor, near Yokohama.
Pomacentrus rathbuni, near Yokohama.
Aboma tsushimæ, Tsushima (Sasuna).
Chasmias misakius, Misaki, Sasuna, in Tsushima.
Watasea sivicola, Misaki; Nanaura in Awa.

In addition to these, four new names are given in place of names already used in the same genus. These are *Limanda herzensteini*, *Chærops azurio*, *Pygosteus steindachneri*, *Cobitis biwæ*.

Two genera, *Watasea* and *Chasmias*, are described as new.

Family SQUATINIDÆ.

1. SQUATINA JAPONICA Bleeker.

591. Yokohama.

Common throughout southern Japan. It has never been carefully compared with *Squatina squatina* nor with *Squatina californica*, and may not be distinct.

Family NARCOBATIDÆ.

2. ASTRAPE JAPONICA (Schlegel).

626. Yokohama.

Rather rare. It has never been critically compared with the East Indian *Astrape dipterygia* (Müller and Henle) and may be the same, as supposed by Dr. Günther.

Family DASYATIDÆ.

3. DASYATIS KUHLI (Müller and Henle).

590. Yokohama.

Common in sandy bays throughout middle and southern Japan. Known in life by its gray or whitish lower side, the still more common *D. akajei* being dull orange.

Family CYPRINIDÆ.

4. CARASSIUS AURATUS (Linnæus).

Oide, near Sendai, in Rikuzen.

Common in all streams of middle and southern Japan.

5. LEUCISCUS HAKUENSIS (Günther).

511, 513, 516, 517, 518. Lake near Oide, near Sendai, Japan.

Scales 75: dorsal inserted behind ventrals. Very common in all streams of the northern half of the main island of Hondo, also in Hokkaido. Unlike most other minnows it runs far out to sea. In two specimens (513, 517) the body is unusually elongate, and the ventrals are placed further back, almost under the dorsal.

6. LEUCISCUS JOUYI, Jordan and Snyder, new species.

(Plate XXXI.)

No. 45,228, U. S. N. M. Sasuna, island of Tsushima. 1885, twelve specimens.

The island of Tsushima affords a species of *Leuciscus*, heretofore unknown, which is very different from *L. hakuensis*, the form common to the greater part of Japan. It is distinguished principally by its depressed head, deep caudal peduncle, and comparatively short anal fin.

We describe it as *Leuciscus jouyi* from type No. 45,228, U. S. N. M. Locality, Sasuna, Tsushima.

Head 4 in length, depth 3½, depth of caudal peduncle 6⅔, eye 4½ in head, snout 3, interorbital 2½, D. 8, A. 8, P. 16; scales in lateral line 68, above lateral line 18; between insertion of dorsal and occiput 41. Teeth 2.5–4.2.

Body deep and compressed, the caudal peduncle notably so. Head very small, pointed, depressed; the width equal to the depth. Interorbital space wide, low, somewhat convex.

Eye large; nearer to tip of snout than to edge of opercle, a distance equal to its diameter. Snout sharp, the jaws equal in length. Mouth small, oblique; lips thin, maxillary reaching a vertical through posterior edge of orbit. Gill-rakers on first arch 2+6; short, pointed, and far apart. Pharyngeal teeth in two rows; 5 — 2 on the left side, 4 — 2 on the right. Those of the major row high, compressed sidewise; the one near the longer straight limb of the arch somewhat rounded and short; one or two teeth on each side slightly hooked; grinding surface present, though not very broad. Teeth of secondary row slender, easily displaced; one on each side showing traces of a grinding surface. Peritoneum silvery. Air-bladder large, with one constriction; alimentary canal short, without convolutions.

Head naked, without barbels or other distinctive dermal characters. Body with scales of medium size. Lateral line complete, not extending on caudal fin; the anterior part bending downward parallel with the ventral contour; posterior part of lateral line in middle of caudal peduncle.

Dorsal inserted midway between center of eye and base of caudal fin; the first ray very short, simple, and closely adnate to the second; third ray longest. Anal inserted a little posterior to base of dorsal, its base short; first simple ray similar to that of dorsal; third ray longest; tips of rays when fin is depressed falling far short of base of caudal. Pectoral fins rather pointed. Ventrals rounded, reaching anal opening.

Body a little darker above than below; a faintly defined, narrow, lighter band along the sides, not visible anterior to the dorsal fin.

One of the cotypes (No. 6,376, Leland Stanford Jr. University Collection) has three teeth on one side in the lesser row.

The collector's notes do not state whether the species was found in salt or fresh water, a question of interest, since the island of Tsushima is said to contain only 262 square miles, about one-third of which is cut off from the larger part by a narrow channel. *Leuciscus hakuensis* is able to live in salt water, the authors having found it in tide pools and offshore at several points along the coast of Japan.

Measurements of Leuciscus jouyi.

Length of body in millimeters	129	106	95	89	81	66	61	53
Depth of body expressed in hundredths of length	.27	.28	.27	.27	.26	.22	.23	.24
Depth of caudal peduncle	.14	.14	.155	.16	.15	.14	.13	.14
Length of head	.26	.25	.25	.265	.26	.26	.26	.26
Depth of head at occiput	.15	.145	.15	.15	.14	.145	.16	.17
Width of interorbital space	.10	.095	.09	.09	.085	.08	.09	.09
Length of snout	.085	.08	.08	.085	.085	.08	.08	.08
Diameter of orbit	.05	.05	.06	.06	.06	.07	.06	.07
Distance from snout to dorsal fin	.56	.55	.555	.58	.58	.55	.58	.56
Height of longest dorsal rays	.18	.18	.20	.20	.185	.19	.18	.19
Distance from snout to anal fin	.67	.68	.67	.69	.69	.66	.68	.67
Height of longest anal rays	.15	.14	.17	.17	.15	.15	.15	.15
Distance from anal to caudal fin	.25	.23	.26	.25	.245	.22	.25	.25
Length of caudal fin	.25	.265	.27	.255	.25	.25	......	.27
Distance from snout to ventral fin	.52	.54	.51	.47	.54	.52	.50	.54
Length of ventral fin	.14	.135	.15	.16	.145	.14	.13	.14
Length of pectoral fin	.17	.16	.18	.18	.18	.16	.17	.18
Number of rays in dorsal fin	8	8	8	8	8	8	8	8
Number of rays in anal fin	8	8	8	8	7	8	8	8
Number of rays in pectoral fin	16	16	16	16	15	15	16	16
Number of scales before insertion of dorsal fin	41	38	37	42	45	43	......	40
Number of scales in lateral line	68	65	63	68	69	64	72	68
Number of scales above lateral line	18	16	18	17	19	19	18	19

7. ACHEILOGNATHUS ?LANCEOLATUM (Schlegel).

519. Lake near Oide. A single specimen of the species common in northern Japan, which may not be different from *A. lanceolatum*.

Family ANGUILLIDÆ.

8. ANGUILLA JAPONICA Schlegel.

No. 45223, U.S.N.M. Sasuna, Tsushima.

The eel is exceedingly common in all fresh and brackish waters of Japan. It is very close to the eel of Europe, *Anguilla anguilla*, and may prove inseparable from it.

9. LEPTOCEPHALUS MYRIASTER (Brevoort).

Yokohama.

Family CLUPEIDÆ.

10. CLUPANODON THRISSA (Osbeck).

(*Chatoëssus punctatus* Schlegel.)

No. 38837, U.S.N.M. Yokohama.

The name *Clupanodon* in our judgment should be retained for the species (*thrissa* Osbeck) to which it was first applied. The "method of elimination" would assign the same type if we admit *Konosirus* as a genus distinct from *Dorosoma*. In this view *Thrissa* Rafinesque and *Konosirus* Jordan and Snyder are synonymous with *Clupanodon*.

Family PTEROTHRISSIDÆ.

11. PTEROTHRISSUS GISSU Hilgendorf.

(*Bathythrissus dorsalis* Günther.)

Locality uncertain, probably from Hakodate, where the species is common in rather deep water.

Family SALMONIDÆ.

12. SALMO MACROSTOMUS Günther.

502.

Skin from Lake Chuzenji, about 18 inches long. Small black spots on head, along back, and on caudal. No parr marks. Snout produced as in breeding males. B. 12, A. 12 (developed rays). Gill rakers 7 + 12. Scales 135. This agrees with *Salmo macrostomus* of Günther, the Yamabe or Yamomi of the fishermen, a species now abundant in Chuzenji Lake, having been planted from the river below the fall of Kegon-no-taki. Lake Chuzenji above this high waterfall was without fish until this and other species were planted there.

13. PLECOGLOSSUS ALTIVELIS Schlegel.

505, 506, 507. Numata.
727. Sasuna, Tsushima.

This dwarf salmon, the famous Ayu, one of the most delicate of all food fishes, runs in abundance in all clear streams of Japan.

Family AULOPIDÆ.

14. AULOPUS JAPONICUS Günther.

(Plate XXXII.)

563. Yokohama market. A fine specimen in good condition.

Family SYNGNATHIDÆ.

15. SYNGNATHUS SCHLEGELI Kaup.

No. 45261 (769), U.S.N.M. Yokohama.

If we accept as the type of a Linnæan genus its "best-known European or officinal species," we may retain the name *Syngnathus* for *S. acus* and its allies, instead of following Rafinesque's restriction of the Linnæan name to *Nerophis pelagicus*.

Family MUGILIDÆ.

16. MUGIL OUR Forskål.

Yokohama.

We refer the common mullet of Japan (*Mugil japonicus* Schlegel) to *Mugil our* of the Red Sea, following the opinion of authors, having no data of our own.

Family TRACHICHTHYIDÆ.

17. HOPLOSTETHUS JAPONICUS Hilgendorf.

621. Yokohama market. 1883. A fine specimen in good condition.

Family HOLOCENTRIDÆ.

18. MYRIPRISTIS JAPONICUS Schlegel.

Yokohama.

Family BERYCIDÆ.

19. BERYX SPLENDENS Lowe.

No. 38836, U.S.N.M. Yokohama.

A fine example, agreeing fairly with the figure of the Atlantic species given by Goode and Bean.

Family POLYMIXIIDÆ.

20. POLYMIXIA JAPONICA Günther.

Probably Yokohama.

It is common at some depth outside the headlands (Awa, Misaki), which bound the Bay of Tokio.

Family SCOMBRIDÆ.

21. SCOMBER JAPONICUS Houttuyn.

Scomber japonicus Houttuyn, 1782.
Scomber auratus Houttuyn, 1782.
Scomber colias Gmelin, 1788.
Scomber pneumatophorus Delaroche, 1805.

583. Yokohama.

The common mackerel of Japan is not visibly different from the smaller mackerel (*colias*, *diego*, and *dekayi*) of the rest of the world. The name *japonicus* given by Houttuyn in 1782 is older than any other. We are indebted to Mr. Barton A. Bean for a copy of the descriptions given by Houttuyn[1] of the fishes from Japan placed in his hands by Dr. Carel Thunberg. These descriptions represent the earliest record of Japanese fishes, and the names of Houttuyn must have precedence over all others, if his descriptions can be identified.

Unfortunately, Houttuyn had little knowledge of fishes. His descriptions are very loosely drawn, and the fin rays in almost all cases are incorrectly given. Still, knowing the fauna of Nagasaki, from which region the specimens of Thunberg must have come, it is not very difficult in most cases to indicate the species intended.

The following identifications seem to us tenable:

NOTE ON THE SPECIES OF HOUTTUYN, 1782.

1. CALLIONYMUS JAPONICUS.

Evidently *Callionymus longicaudatus* Schlegel, as recognized by Schlegel himself. It must therefore stand as **Callionymus japonicus**. D. IV–10; A. 8. C. 9. The tail 4 inches long, the body 5½, a black ocellus on front dorsal.

2. URANOSCOPUS JAPONICUS.

Doubtless *Uranoscopus asper* Schlegel. It must stand as **Uranoscopus japonicus** Houttuyn.

D. IV–15; P. 12. First dorsal black; body yellow above, white below. Based, like most of Houttuyn's descriptions, on a young specimen.

3. CORYPHÆNA JAPONICA.

Apparently *Latilus sinensis* = *L. argentatus* Cuvier and Valenciennes The species must stand as **Latilus japonicus**.

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[1] Beschryvning van eenige Japansche visschen, en andere zee-schepselen; door M. Houttuyn, in Verhandelingen, iutgegeeven door de Hollandsche Maatschappij der Weetenschappen te Haarlem, XX Deels, 2 Stuk, 1782, pp. 311–346. This paper has been kindly translated for us by Mr. Leo G. D. Muller, of Stanford University.

It is, according to Houttuyn, a Dolphin, from its blunt head. Color apparently bright yellow but not preserved very well. Closed gill coverings with a groove crosswise. D/24; P. 14; V. 6; C. 17. Body covered with fine scales. Lacépède calls this species *Coryphænoides houttuyni*, but his generic name *Coryphænoides* was used still earlier by Gunner for a Macrurid.

4. GOBIUS NIGER Linnæus.

Some Goby incorrectly identified.

5. PLEURONECTES JAPONICUS.

Japanese Scharretong.

Form of the European Scharrétong. Eyes on the left side. P. 9; V. 5; C. 16. Dorsal and anal rays not counted owing to the great number. Body 6 inches long, somewhat round on the dorsal side, and white below.

This may be *Paralichthys olivaceus*, but we hesitate to make the identification.

The name *Pleuronectes japonicus* given by Herzenstein to a common flounder of the island of Hokkaido, is preoccupied by *Pleuronectes japonicus* of Houttuyn. Herzenstein's species may receive the new name of **Limanda herzensteini**.

6. SPARUS AURATUS Linnæus.

An erroneous identification with a European species.

7. SPARUS ARGENTATUS.

This is *Sciæna sina* Schlegel, *Sciæna schlegeli* Bleeker. It may stand as **Corvula argentata**. Black spot on opercle; color of body silvery. D. IX, 26; P. 16; V. 9; A. 1, 8; C. 18. Length 8; depth 2½ inches.

8. SPARUS NOTATUS.

This is a species near *Apogon semilineatus* Schlegel, but not recognized by later writers. It may stand as **Apogon notatus**.

Small black spots behind the gill coverings, close to the caudal fin, and on the dorsal fin. Hardly a finger long and covered with silvery scales. Dorsals, two. D. V–8; A. 8; P. 10; C. 14.

9. SPARUS ERYTHRINUS Linnæus.

An incorrect identification of a European species.

10. SPARUS LATUS.

This must be *Chrysophrys aries* Schlegel, which must stand as **Sparus latus**.

Scales in stripes lengthwise. In body one of the widest of the family if not the widest, half as wide as long. Color, yellowish; the head silvery under the scales. D. XII, 9; P. 12; A. III, 8; V. 1, 5; C. 18.

11. SPARUS VIRGATUS.

This seems to be *Dentex setigerus* of Schlegel = *Nemipterus sinensis*. It may stand as **Nemipterus virgatus**.

Stripes of the scales plainer and larger than in *Sparus latus*. Similar to the Salpa of authors, which has on each side eleven stripes of a golden hue, hence called in French "Virgadelle." Body oval and flat, head obtusa, tail forked. D. VIII, 10; P. 12; A. 11, 8; V. 6; C. 22. Length, 5½ inches.

12. SPARUS FUSCESCENS.

This seems to be a *Sebastodes*, *Sebastodes inermis*=*Sebastodes ventricosus* without much doubt. The species may therefore stand as **Sebastodes fuscescens**.

A black spot on the pectoral fin, body brownish, the color perhaps due to "the falling off of some golden scales." Body fairly wide; mouth armed with small teeth; lateral line straight. D. XIII, 11; P. 16; V. 1, 5; A. II, 10. Length, 4 inches.

13. LABRUS JAPONICUS.

We can not make this out. Gill coverings scaly. Small sharp-pointed teeth, and not double lips; pectorals sharp; lateral line almost straight. D. X, 11; P. 16; V. 1, 5;

A. III, 5; C. 18. Color bright yellow. Length, about 6 inches; depth, 2; thickness, 1 inch. It is perhaps most like *Pseudolabrus eothinus*.

The name *Labrus japonicus* Schlegel, is preoccupied by this name of Houttuyn. Schlegel's species may receive the new name of **Chærops azurio.** It is a common food fish of Southern Japan.

14. LABRUS BOÖPS.

This is *Scombrops cheilodipteroides* Bleeker, and may stand as **Scombrops boops.**

Eyes very large, more than half an inch in diameter, thus taking up a very large part of the head. Gill covers scaled. Lower jaw, the longer with fairly long and sharp teeth. Dorsal fins, 2. D. V. 12; P. 14. V. 1, 5; A. 11; C. 22.

15. PERCA FASCIATA.

This seems to be *Epinephelus septemfasciatus* (=*susuki*=*octocinctus*). The same name *Perca fasciata* was given still earlier by Forskål, to another species also found in Japan, *Epinephelus fasciatus* (=*marginalis*) the type of the genus *Epinephelus*.

16. GASTEROSTEUS VOLITANS Linnæus.

This is *Pterois volitans* and refers to *Pterois lunulata* Schlegel.

17. GASTEROSTEUS JAPONICUS.

This is **Monocentris japonicus**, a species of which Houttuyn justly says: "I have never seen the equal of it." The same name *Gasterosteus japonicus* has been given by Steindachner to a true stickleback. The name of the latter thus preoccupied may be changed to that of **Pygosteus steindachneri.**

18. SCOMBER JAPONICUS.

This is the common mackerel of Japan, the Saba of the fisherman. We can not separate it from *Scomber colias* of Europe. Houttuyn's name *Scomber japonicus*, 1782, has priority over *Scomber colias* Gmelin, 1788, or *Scomber pneumatophorus* Delaroche, 1805.

19. SCOMBER AURATUS.

A little mackerel, 7 inches long, distinguished by its gilded color. D. IX, —; finlets, 5; P. 18; A. 6; V. 6. This must be the same as **Scomber japonicus.**

20. SCOMBER TRACHURUS Linnæus.

A common Japanese fish, close to *Trachurus trachurus*, apparently the same.

21. CENTROGASTER FUSCESCENS.

This is *Siganus fuscescens*, from which Schlegel's *Amphacanthus albopunctatus* and *aurantiacus* do not seem to be different.

Centrogaster (= *Siganus* Forskål = *Amphacanthus* Bloch) is a new genus defined by the "strange growth of the ventral fins, which are like those in the Snottolf, named by Mr. C. Noseman, *Cyclogaster*, grown together by a membrane which in this case is supported by four sharp spines and six limber rays." The name is here misprinted "Cantrogaster." The confusion of the structure of the ventrals in *Siganus* with that found in *Liparis* shows that Houttuyn had no training in ichthyology.

22. CENTROGASTER ARGENTATUS.

This is *Leiognathus*, or *Equula nuchale*, one of the commonest of Japanese fishes. It may stand as **Leiognathus argentatum.**

Entirely silvery, as if covered with silver plate. A large, round, brown spot on the back behind the head, and a black one in the dorsal fin. D. VIII; A. 11, 12. Depth, 1½; length, 3 to 4 inches.

23. MULLUS JAPONICUS.

This is some species of *Upeneus*. It has been regarded as *Mullus bensasi* Schlegel, but there is little certainty of this identification. D. VII-9. Caudal forked; mouth toothless. Color more yellow than red. Length, 6 inches. A specimen from Tokyo agrees with Houttuyn's account.

24. MULLUS IMBERBIS Linnæus.

Incorrect identification of some *Apogon* with a Linnæan species.

25. TRIGLA ALATA.

This is *Lepidotrigla burgeri* (Schlegel) and must stand as **Lepidotrigla alata.**

Four inches long; head not rounded; the upper maxillary with two sharp, protruding points, such as are also behind on the gill coverings. P. 7-3; D. VII; A. 14; C. 14; V. 6. Dorsal fin in a bony groove made by two rows of sharp scales along the back.

26. COBITIS JAPONICA.

This is *Saurida argyrophanes*, or some other species of soft rayed fish. Head beardless, rather short; mouth in both jaws full of sharp teeth; body, terete and fleshy, like that of a snake or an eel. D. 12; P. 12; V. 8; A. 9. Length, 5 inches. We do not feel sure of the identification.

The name *Cobitis japonicus* Schlegel, applied to the common "Shimadojo" or striped loach of Japan, is thus preoccupied, and may give place to the new name **Cobitis biwæ** from the largest of the Japanese lakes, where the species abounds.

27. SILURUS INERMIS.

This is a *Platycephalus*, in all probability *Platycephalus crocodilus* Tilesius = *guttatus* Schlegel. The species may stand as **Platycephalus inermis.**

No barbels or serrated pectoral spine. Body terete, scaled. Head very flat, with large eyes, close together as in the Stargazer. Opercle with two fine spines. D. VII-11; P. 20; V. 6; A. 10; C. 13. Caudal fin roundish, black and white spotted—like all the other fins. Body reddish. Jaws without teeth. Length, 6 inches.

28. FISTULARIA TABACARIA Linnæus.

Incorrect identification of an Atlantic species.

29. ATHERINA JAPONICA.

The species, the type of Lacépède's genus *Stolephorus*, is certainly *Spratelloides gracilis* (Schlegel). It is identified by Bleeker with *Atherina bleekeri* Günther, a species common at Nagasaki. Günther regards it as identical with *Engraulis commersonianus*, a Chinese anchovy, not yet found in Japan. But the description almost certainly belongs to *Spratelloides*, to which genus the name *Stolephorus* must be transferred, the species standing as **Stolephorus japonicus.**

The genus of Anchovies, heretofore called *Stolephorus* by us, must stand as *Anchovia* Jordan and Evermann, unless it be reunited with *Engraulis*, from which it does not greatly differ.

The remaining species are all those of Linnæus or Osbeck, correctly or incorrectly identified.

30. CLUPEA THRISSA, **Clupanodon thrissa** (Osbeck) = *Konosirus punctatus* (Schlegel).

31. RAJA RHINOBATUS is probably *Rhinobatus schlegeli.*

32. SQUALUS CANICULA is probably *Halælurus burgeri.*

33. LOPHIOS PISCATORIUS is *Lophiomus setigerus.*

34. BALISTES MONOCEROS is *Aluteres monoceros.*

35. OSTRACION QUADRICORNIS is *Ostracion cornutum or Aracana aculeata*

36. OSTRACION CUBICUS is *Ostracion tuberculatum.*

Family CARANGIDÆ.

22. TRACHURUS TRACHURUS (Linnæus).

(*Caranx trachurus Japonicus* Schlegel.)

585. Yokohama.

We find no difference between this most abundant fish and *Trachurus trachurus* of the Atlantic.

23. CARANGUS EQUULA (Schlegel).

Yokohama.

Generally common. It is probable that Gill and Bleeker are right in regarding *Caranx speciosus*, the only species known to Commerson, as the type of the genus *Caranx* accepted by Lacépède from Commerson's manuscripts. *Carangus* Griffith should be preferred to *Tricropterus* Rafinesque of earlier date, because under *Tricropterus* no species were mentioned by its author.

Family APOGONIDÆ.

24. APOGON UNICOLOR Döderlein Ms., new species.

(Plate XXXIII.)

Apogon unicolor is here described from the type No. 49708, U.S.N.M., a specimen 75 millimeters long, in a poor state of preservation. Collected at Yokohama, Japan, by P. L. Jouy.

Head, 2⅔ in length; depth, 2⅚; depth of caudal peduncle, 6½; diameter of eye, 3⅙ in head; snout, 3⅔; maxillary, 1⅙. D. VI–I + 9; A. II + 8; P. 13. Scales in lateral line 24; between lateral line and spinous dorsal 2; between lateral line and anal 13.

Depth of body a little less than length of head; the caudal peduncle long and comparatively slender, narrowest near the middle. Interorbital space convex. Snout bluntly pointed.

Eye large; the diameter greater than length of snout. Mouth oblique; jaws equal; maxillary reaching almost to posterior edge of orbit; its upper edge covered for nearly the entire length by the suborbital. Teeth villiform; in bands on jaws, palatines, and vomer; the toothed area of the palatines very small. Gill-rakers on first arch, 5+13; those near the center of the arch very slender; near the ends they are reduced to minute knobs.

Opercles and preopercles with large, weakly ctenoid scales; other parts of head naked, the skin thin and transparent; opercle with a small, sharp spine on its posterior edge. Body with large, ctenoid scales; those on posterior end of caudal peduncle small, encroaching on base of caudal fin. Lateral line complete; similar in shape to contour of back.

First spine of dorsal small, little longer than the sixth; the second strongest and highest; the others successively shorter and weaker; the fin where depressed reaching just past insertion of second dorsal. Spine of soft dorsal slender and straight; equal in height to vertical diameter of eye; the rays about one and two-third times as long as the spine. Anal inserted directly below middle of second dorsal; the first spine minute; the second as long as the spine of soft dorsal; the depressed rays reaching posteriorly about as far as those of the dorsal, both falling short of the base of the caudal. The shape of the caudal can not be definitely determined; it probably was round posteriorly, at least not deeply forked. Pectorals reaching as far back as insertion of anal. Ventrals extending to a point midway between vent and anal.

Color in spirits, uniform light yellowish brown, except a subdued, dusky dash across the distal end of pectoral, and an indistinct spot of same color on the opercle near the base of pectoral. It was doubtless nearly plain red in life, without spot or band.

This seems to be the species recorded from Tokio by Steindachner and Döderlein under the name of *Apogon bifasciatus* Rüppell. But the species shows no trace of dark bars and can not be Rüppell's species, which came from the Red Sea. Döderlein records it under the manuscript name of *Apogon unicolor*, which name Steindachner does not adopt.

Measurements of Apogon unicolor.

Length of body in millimeters	.59
Depth of body expressed in hundredths of length	.35
Depth of caudal peduncle	.15
Length of head	.38
Depth of head at occiput	.27
Width of interorbital space	.08
Length of snout	.09
Length of maxillary	.19
Diameter of orbit	.12
Distance from snout to spinous dorsal	.46
Height of longest dorsal spines	.17
Height of longest dorsal rays	.22
Distance from snout to anal fin	.67
Height of longest anal rays	.23
Length of caudal peduncle	.27
Length of caudal fin	.29
Distance from snout to ventral fin	.40
Lenghth of ventral fin	.25
Length of pectoral fin	.28

The generic name *Ostorhinchus* Lacépède may be used as a genus or subgenus for the species of *Apogon*, having seven dorsal spines, all the Atlantic species or true *Apogon* having six.

25. SCOMBROPS BOOPS (Houttuyn).

(*Scombrops cheilodipteroides* Bleeker.)

2352, 2538 Yokohama; 45305 (729), Tsushima, 1885.

Everywhere common along the coasts of middle and southern Japan, in rather deep water.

Family SERRANIDÆ.

26. NIPHON SPINOSUS Cuvier and Valenciennes.

619. Yokohama.

This large species is nowhere very common. It is most frequently seen about Tokyo.

27. LABRACOPSIS JAPONICUS Steindachner and Döderlein.

Yokohama. Two specimens.

Rare; known only about Tokyo. Colors faded, apparently red in life, a broad pale lateral band broader than eye running from upper posterior angle of opercle, and narrowly edged above and below with darker. Caudal with a narrow black stripe cutting off the angles, which are whitish.

28. CHELIDOPERCA HIRUNDINACEA (Cuvier and Valenciennes).

603 (2 specimens). Yokohama.

Very rare, taken in the Kuroshiwo about Tokyo.

29. EPINEPHELUS SEPTEMFASCIATUS (Thunberg).

(*Serranus octocinctus* Schlegel.)

No. 45307 (726), U.S.N.M. Sasuna, Tsushima, Japan. 1885, two examples.

Common along the coasts of Hondo and Kiushu.

Family PENTACERIDÆ

30. HISTIOPTERUS TYPUS Schlegel.

625. Yokohama.

Rather rare, from off Tokyo southward.

Family PRIACANTHIDÆ.

31. PSEUDOPRIACANTHUS NIPHONIUS (Cuvier and Valenciennes).

624. Yokohama.

Rather rare, from Misaki southward.

Family HÆMULIDÆ.

32. PLECTORHYNCHUS CINCTUS (Cuvier and Valenciennes).

618. Yokohama.

Common, from Tokyo southward.

33. SCOLOPSIDES INERMIS Schlegel.

Yokohama.

This specimen agrees with Günther's description and Schlegel's figure in essential respects. Scales 34.

A second specimen, No. 623, Yokohama, has the body deeper. Depth, $3\frac{3}{5}$ in length to base of caudal; head, $3\frac{1}{5}$ in length; eye, $2\frac{4}{5}$ in head. D. X, 8. Color in both red, with faint darker cross-bands.

Family SPARIDÆ.

34. SPARUS SCHLEGELI (Bleeker).

Yokohama.

This common species needs comparison with others found in the East Indies and off the coast of India. It is abundant in all harbors of Hondo and Kiushu.

Family KYPHOSIDÆ.

35. GIRELLA PUNCTATA Gray.

No. 26260, U.S.N.M. Tokyo probably. (Coll. Edward S. Morse.) Everywhere common about rocks on shores of Hondo and Kiushu.

Family SCIÆNIDÆ.

36. CORVULA ARGENTATA Houttuyn.

(*Sciæna schlegeli* Bleeker.)

578. Yokohama.

Generally common in sandy bays.

Family CIRRHITIDÆ.

37. CHEILODACTYLUS ZONATUS Cuvier and Valenciennes.

577. Yokohama.

Generally common in Kiushu and Hondo.

Family POLYNEMIDÆ.

38. POLYDACTYLUS PLEBEIUS (Broussonet).

Yokohama (2).

In sandy bays from Tokyo southward, not very common.

Family EMBIOTOCIDÆ.

39. NEODITREMA RANSONNETI Steindachner.

45311. Tsushima.

One large specimen in bad condition. This species seems very local in its distribution, occurring in abundance in Koajiro Bay, near Misaki, but not seen elsewhere by us.

Family POMACENTRIDÆ.

40. AMPHIPRION FRENATUS Brevoort.

Two specimens taken at Shimoda, Izu, Japan, by J. Morrow, of Commodore Perry's expedition.

These are the basis of Gill's account[1] of *Amphiprion frenatus*, a species originally described from the Riu Kiu Islands.

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[1] Proc. Acad. Nat. Sci. Phila., 1859, p. 148.

From near the original locality (Okinawa) we have also a single specimen received from the Imperial University of Tokyo.

These specimens differ in color and in the depth of the body.

The Okinawa specimen (in spirits) has the greater part of the body bright chocolate brown, without bands or stripes; lighter below and in the region of the pectoral fins. The Shimoda specimens have the body of a pale yellowish brown color, with three light lateral bands extending along the sides; wider apart and broader anteriorly, converging and becoming narrower on the caudal peduncle. Many of the scales of the body have each a small light spot. In each case the fore part of the head is of the same general color as the body. The width of the vertical band of blue varies somewhat in each individual.

The depth of the first-mentioned specimen is .53 of the total length; the scales between the lateral line and insertion of the dorsal are in 6 series; between the lateral line and the anal, 16. In the larger of the Shimoda specimens, which is of equal length with the one from Okinawa, the depth measures .56; the scales number 7–20. The smaller one measures, depth, .60; scales, 7–20. The scales in the lateral line of the three number, respectively, 46, 48, and 47 scales. The fin rays are as follows: Okinawa specimen D. IX, 19; A. II, 15; Shimoda examples D. IX, 19; A. II, 14, and D. IX, 17; A. II, 14.

Believing that these differences, though considerable, are of such a nature that a large series of specimens would show them to be merely individual variations, we do not deem it advisable to record the examples at hand as belonging to two different species.

41. POMACENTRUS TRILINEATUS Bleeker.

(*Pomacentrus dorsalis* Gill.)

Shimoda, J. Morrow: the original type of *Pomacentrus dorsalis* Gill.

Dr. Bleeker regards *Pomacentrus dorsalis* as probably identical with *Pomacentrus trilineatus* from the East Indies. We are indeed unable to detect any difference between Gill's type from Shimoda and those two of Dr. Bleeker's figures[1] which correspond nearest to it in stage of development, showing two white bands on the anal, the blue dots on the head and the black dorsal ocellus, preceded by white, except that the body in the Shimoda specimen is a very little deeper, the depth 2 in length. This species belongs with the preceding and the next to the fauna of the rock pools flooded by the Kuro Shiwo. Except Gill's type no second specimen has been taken in Japan. This species having the teeth angulate at the tip, and in a single row, is a *Parapomacentrus* in Bleeker's arrangement. Bleeker says that the teeth are biserial, which would place it in his division *Pomacentrus*. We find but one row.

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[1] Atlas Ichth., pl. CCCVI, figs. 1 and 2.

42. POMACENTRUS RATHBUNI Jordan and Snyder, new species.

(Plate XXXIV.)

This species is characterized by having the preorbital smooth; the depth of the body contained 2⅓ times in length; the number of scales in the lateral series 27; the teeth subtruncate; the dorsal with 13 spines and 11 rays; the anal with 2 spines, 11 rays; the fin rays filamentous, and the fins without bands or spots.

Type No. 49706, U.S.N.M. Locality, near Yokohama, Japan; doubtless from Misaki or Boshu. Collected by P. L. Jouy.

Head 3⅓ in length; depth 2⅓; depth of caudal peduncle 6⅙; eye 2⅕ in head; snout 4; interorbital space 3; maxillary 3; dorsal XIII, 11; anal II, 11; scales in lateral line 27; between lateral line and insertion of dorsal 3; between lateral line and insertion of anal 9.

Eye large; somewhat oblong; interorbital space convex; its width equal to vertical diameter of eye. Snout short; rounded. Jaws subequal; cleft of mouth oblique; maxillary extending posteriorly to edge of orbit; its length equal to width of interorbital space. Teeth in a single row; firmly embedded; 42 in upper jaw, 34 in the lower; incisor-like; broad anteriorly, the cutting edge scarcely rounded; narrower and gradually becoming pointed posteriorly. Gill-rakers on first arch 21; long, slender, with minute bristles on the sides. Preorbital narrow, its edge not notched. Edge of suborbital serrated; not adnate to cheek. Posterior edge of preopercle finely serrated; the lower edge entire. Opercle with a rather large flat spine, above which are two closely opposed smaller ones.

Scales ctenoid. Head with scales everywhere except on preorbital, symphysis of lower jaw and branchiostegal region. Body completely scaled. Dorsal and anal fins with a low sheath of scales along their bases. Interradial membranes of dorsal, anal, caudal and pectoral fins with thin, oblong scales. Lateral line interrupted in the region of the seventeenth vertical row of scales, beginning again on the third row below, where it is represented by a single pit in each scale.

Dorsal spines growing longer consecutively to the fourth; others of about equal length; middle rays of dorsal filamentous. First anal spine about one-half as long as the second; the latter a little shorter than the rays; posterior rays filamentous. Caudal deeply forked; the longest upper and lower rays filamentous. Pectoral pointed, the upper rays longest. First (outer) ray of ventral filamentous.

No distinct color marks on alcoholic specimen. A mere suggestion of a dark spot immediately above gill opening; a small light brown spot at upper edge of base of pectoral; edges of unpaired fins narrowly washed with brownish; a narrow, indistinct, light band along the center of each lateral row of scales.

The cotypes (No. 6464, L. S. Jr. University Museum) show some variation in the shape of the body, being a little less deep than in the type and having a snout somewhat less arched. The eye also varies slightly in size.

The species is named for Richard Rathbun, assistant secretary of the Smithsonian Institution.

Measurements of Pomacentrus rathbuni.

Length in millimeters	55	57	58	52
Depth expressed in hundredths of length	45	43½	45	42½
Depth of caudal peduncle	15	15	15	15
Length of head	30	32	31	30
Width of interorbital space	8	9	8½	9
Length of snout	6	7½	8	8
Diameter of orbit	11½	10	9½	11
Distance from snout to dorsal fin	35½	33	34	34
Height of longest dorsal spine	21	19	18	18
Height of longest dorsal ray[1]	36	28	32	26
Distance from snout to anal fin	66	70	68	66
Height of longest anal spine	21½	22	21	22½
Height of longest anal ray[1]	27½	25	25	26
Length of caudal peduncle	19	19	20	20
Length of caudal fin[2]	32	30	28	29
Length of pectoral fin	27	25	27	25
Distance from snout to ventral fin	39½	44	43	38
Length of ventral fin[2]	24	21	22	22
Number of dorsal spines	13	13	13	13
Number of dorsal rays	11	11	11	11
Number of anal rays	11	11	11	11
Number of scales in lateral line	27	27	26	26
Number of scales between lateral line and insertion of dorsal	3	3	3	3
Number of scales between lateral line and insertion of anal	9	9	8	9

[1] Including filaments.

[2] Not including filaments.

This species is allied to *Pomacentrus violascens* and others having the soft dorsal few-rayed and with some of the rays filamentous. Having the teeth truncate at tip and in a single row, it would be referred to Bleeker's genus *Eupomacentrus*, a group apparently not of generic value.

43. ABUDEFDUF SEXFACIATUS (Lacépède).

(*Glyphidodon cœlestinus* Brevoort.)

Two specimens from Shimoda: Coll. J. Morrow, noticed by Professor Gill in 1859.

Numerous others were taken by us in the rock pools off Misaki.

44. CHROMIS NOTATUS (Schlegel).

729. Tsushima, Yokohama.

Family LABRIDÆ.

45. CHŒROPS AZURIO Jordan and Snyder.

(*Chœrops japonicus* Schlegel, not of Houttuyn.)

609. Yokohama.

46. DUYMÆRIA JAPONICA Bleeker.

Ctenolabrus flagellifer Schlegel, probably not of Cuvier and Valenciennes.

Yokohama.

Everywhere common on the shores of Kiusiu and southern Hondo.

47. PSEUDOLABRUS EOTHINUS (Richardson).

(*Labrus rubuginosus* Schlegel; name preoccupied.)

No. 45301, U.S.N.M.

726, 729. Tsushima.

Five specimens in very bad order.

This species is generally common on the shores of Kiusiu and Hondo.

48. HALICHŒRES PŒCILOPTERUS (Schlegel).

606. Yokohama.

Generally common in sandy bays from Hakodate southward.

Family CHÆTODONTIDÆ.

49. HOLACANTHUS SEPTENTRIONALIS Schlegel.

560, 596. Yokohama.

This handsome species, which is a true *Holacanthus* in Bleeker's classification, is rather rare about rocky points in the Kuro Shiwo.

Family OPLEGNATHIDÆ.

50. OPLEGNATHUS FASCIATUM (Schlegel).

(*Hoplognathus krusensteri* Günther.)

567. Yokohama.

Common from Hakodate southward.

Family TEUTHIDÆ.

51. PRIONURUS SCALPRUM (Cuvier and Valenciennes).

579. Yokohama.

Common about rocky points from Tokio southward.

Family SCORPÆNIDÆ.

52. SEBASTODES FUSCESCENS (Houttuyn).

(*Sebastes inermis* Cuvier and Valenciennes.)
(*Sebastes ventricosus* Schlegel.)

No. 45273, U.S.N.M. Tsushima.

Generally common from Matsushima southward.

53. SEBASTODES JOYNERI (Günther).

Yokohama.

Not uncommon on the coast of Hondo. The form of the dark bars is subject to some variation.

54. SEBASTODES PACHYCEPHALUS (Schlegel).

575. Yokohama.

Rather common about rocks from Misaki southward.

55. HELICOLENUS MARMORATUS (Cuvier and Valenciennes).

No. 45310, U.S.N.M. Tsushima.

573, 598. Yokohama.

One of the commonest fishes in Japan and subject to large variations in color, according to its surroundings.

56. HELICOLENUS ALBOFASCIATUS (Lacépède).

Yokohama.

Found about rocks in the Kuro Shiwo or "black current" from the south, where it is rather common at some depth. This species is very close to *Helicolenus marmoratus*, differing chiefly in color and in the presence of a small spine below the eye which is wanting in the shore species, *H. marmoratus*. We are indebted to Dr. Franz Hilgendorf for an account of Lacépède's type of *Holocentrus albofasciatus*, still preserved in the museum at Berlin. This account agrees fully with the species in hand.

57. PARACENTROPOGON NUDUS (Günther).

Yokohama.

This little Okose or poison fish is common about rocks from Misaki to Hiroshima. None of our specimens from this region possess any scales. We therefore regard *P. nudus* as a species distinct from *P. longispinis*, which is said to have evident scales.

Family HEXAGRAMMIDÆ.

58. HEXAGRAMMOS OTAKII (Jordan and Starks).

Yokohama.

Everywhere common from Hakodate southward.

Family COTTIDÆ.

59. PSEUDOBLENNIUS PERCOIDES (Günther).

No. 45308, U.S.N.M. Tsushima.

No. 45309, U.S.N.M. (726.)

60. PSEUDOBLENNIUS SCHLEGELI (Döderlein).

602. Yokohama.

This form or species lacks the black spots and other dark markings characteristic of *Pseudoblennius percoides*, but is probably not specifically different.

61. PSEUDOBLENNIUS MARMORATUS (Steindachner).

No. 45306, U.S.N.M. Satsuma, Tsushima.

Family PERISTEDIIDÆ.

62. PERISTEDION ORIENTALE Schlegel.

627. Yokohama.

This species agrees very ill with Schlegel's description, which was drawn up from an imperfect specimen. The dorsal especially is not continuous, but divided by a deep notch. It is not rare in deep water from Tokyo southward.

Family CEPHALACANTHIDÆ.

63. CEPHALACANTHUS JAPONICUS (Bleeker).

(? *Dactylopterus peterseni* Nystrom.)

Yokohama.

Interorbital space very wide, half length of head, differing in this regard from *C. spinarella* (*orientalis*) of the East Indies. *D. peterseni* seems to be the young of this species, which is common about the headlands from Misaki to Nagasaki.

Family SILLAGINIDÆ.

64. SILLAGO JAPONICA Schlegel.

584. Yokohama.

No. 26241, U.S.N.M. Tokyo (E. S. Morse).

Four rows of scales between dorsal and lateral line. Scales 70. Dorsal XI–I, 22. This species is probably different from *Sillago sihama* (Forskal) found farther south.

Family PERCOPHIDIDÆ.

65. NEOPERCIS SEXFASCIATA (Schlegel).

Yokohama.

Tokyo (E. S. Morse).

66. PARAPERCIS PULCHELLA (Schlegel).

612. Yokohama.

The generic name *Parapercis* Bleeker 1872 (*cylindrica*) must replace *Percis*, which was first given by Scopoli to a genus of *Agonidæ*. *Parapercis* Steindachner is a different genus, subsequently called *Neopercis* by the same author.

Family ECHENEIDÆ.

67. REMORA SEXDECIMLAMELLATA (Eydoux and Gervais).

Yokohama.

Plates 17. Perhaps identical with *Remora brachyptera* of the Atlantic. Comparison of specimens is needed.

Family GOBIIDÆ.

68. CTENOGOBIUS SIMILIS (Gill).

(Plate XXXV.)

(*Rhinogobius similis* Gill, young.)
(*Gobius yokohamæ* Günther, female.)

Tsushima.

Specimens very large and dark, much larger than those from Tokyo, Nagasaki, or Lake Biwa. The male with the dorsal edged with white, the first spine produced in a long filament. Mouth larger and lips thicker in the male than in the female. This is the commonest species of goby in the streams and lakes of Japan, abundant everywhere southward in sluggish water among weeds. We have specimens from Tokyo, Lake Biwa, Tsushima, Aomori, Iyo in Shikoku, Kurume, Kawatana, and Nagasaki. We may perhaps recognize *Ctenogobius* (=*Rhinogobius*, *Acentrogobius*, etc.) as distinct from *Gobius*, wanting the free or silky rays of the upper side of the pectoral, which are characteristic of the typical species of *Gobius*, none of which are found in Japan. In *Ctenogobius*, as in *Aboma*, the isthmus is very broad, the mouth moderate, the tongue not notched, the head rounded above, and the scales rather large and ctenoid. *Aboma* apparently differs from *Ctenogobius* in having seven or eight anal spines instead of six.

69. ABOMA TSUSHIMÆ Jordan and Snyder, new species.

Collected at Sasuna, Tsushima, Japan, by P. L. Jouy.

Description of type No. 45351, U.S.N.M.

Head, 3½ in length; depth, 5⅗; depth of caudal peduncle, 2¾ in head; eye, 4; snout, 3⅓; maxillary, 2⅗; D. VIII–12; A. 11; P. 17; scales in lateral series, 33; in transverse series, 9.

Body not notably elongate; gradually diminishing in size from the region of pectoral fins backward. Head as wide as body, but less deep. Snout very blunt; rounded when viewed from above; truncate when seen from the side.

Eyes high in head; directed obliquely upward; interorbital space very narrow. Jaws subequal, the lower slightly included. Mouth rather small; the cleft somewhat oblique. Lips large. Maxillary, except the tip of the distal end, concealed; extending to a vertical through a point a little behind anterior edge of orbit. Space between orbit and maxillary about equal to longitudinal diameter of eye. Tongue broad; rounded anteriorly; its free edge narrow. Teeth simple; in narrow bands on jaws; outer ones largest, slender, sharp, slightly curved; the ones on sides of lower jaw enlarged, though not notably so, there being no strong canines. Gill-opening not extending far forward; the width of isthmus about equal to length of maxillary. Inner edge of shoulder girdle projecting as a sharp ridge, without papillæ or other dermal modifications. Gill-rakers on first arch, 2 + 7 or 8; short and pointed. Anterior nostril with a high rim. No barbels on jaw.

Head naked. Body with large, finely ctenoid scales; the region immediately anterior to pectorals, the breast in front of ventrals, and a narrow space extending backward nearly to vent naked.

Dorsal fins separate from each other and from the caudal; second spine highest; the others successively shorter, when depressed just reaching origin of soft dorsal; dorsal rays, when depressed, falling far short of base of caudal. Anal inserted directly below base of third dorsal ray; the rays somewhat longer posteriorly, when depressed extending as far back as the dorsal. Pectorals pointed, their tips reaching a vertical through insertion of soft dorsal; the upper rays with appendages. Ventrals long, not extending so far posteriorly as pectorals; free from body except at base.

Color in alcohol light brownish, everywhere with small, indistinct darker spots and reticulations; sides with six or seven poorly defined lateral spots, the last and most conspicuous one at base of caudal fin. Dorsals with markings of light brown, arranged in longitudinal rows on the membranes; similar marks assembled in wavy lines on the rays of upper three-fourths of caudal; the lower part of fin without spots. Other fins somewhat dusky.

Specimens smaller than the type have the dark markings a little more distinct.

Measurements of Aboma tsushimæ.

Length in millimeters	48	44	43	40
Depth expressed in hundredths of length	17½	16	15	15
Depth of caudal peduncle	9½	9	8	9
Length of head	28½	28	26½	27
Length of snout	10	10	9	9
Width of interorbital space	2	2	2	2
Diameter of orbit	7	7	7	8
Distance from snout to spinous dorsal	35	35	35	35
Distance from snout to soft dorsal	55	54	53	55
Height of longest dorsal spines	17	19	14	11
Height of longest dorsal rays	16½	14	14	17
Distance from snout to anal fin	57	56½	58	57
Height of longest anal rays	14	15	12½	14
Length of caudal peduncle	23	24	22½	23
Length of caudal fin	26	25	24	21
Length of pectoral fin	24	18	21	24
Length of ventral fin	21	22	23	22
Number of dorsal spines	8	8	8	8
Number of dorsal rays	12	11	11	11
Number of anal rays	11	11	11	11
Number of pectoral rays	17	17	17	16
Number of scales in lateral series	33	32	34	32
Number of scales in transverse series	9	8	8	9

70. ACANTHOGOBIUS FLAVIMANUS (Schlegel).

586. Yokohama.
728. Tsushima.

Generally common in brackish water, throughout southern and middle Japan.

CHASMIAS Jordan and Snyder, new genus.

71. CHASMIAS MISAKIUS Jordan and Snyder, new species.

(Plate XXXVI.)

A single poorly preserved specimen of this form was collected by Jouy at Tsushima. We describe it from much better specimens collected at Misaki. The species very closely resembles *Chasmias dolichognathus* (Hilgendorf). It differs from it in coloration, not having very distinct, narrow, wavy, dark bands on pectorals, dorsals, and caudal, and in having a terminal band of white on the caudal, a sharper snout, and much smaller scales.

Type.—No. 6484. L. S. Jr. University Museum.

Locality.—Misaki, Sagami, Japan; Jordan and Snyder collectors.

Head, 3⅕ in body; depth, 4⅔; depth of caudal peduncle, 2½ in head; length of snout, 2⅔, maxillary, 1⅖; D. VI–11; A. 10; P. 21; scales in lateral series, 89; in transverse series, 28.

Body thick-set; the caudal peduncle deep; head very broad; depressed; wider posteriorly than the body; snout, viewed from above, broadly rounded. Eyes small; directed obliquely; interorbital space markedly wide, the distance between the eyes equal to the length of the snout. Mouth extremely large; horizontal; lower jaw included by the upper, the wide upper lips hanging down over the lower; upper lip with a fringed interior border next the teeth. Maxillary extending posteriorly to a vertical through a point midway between eye and edge of opercular flap; covered for the greater part of the length. Tongue very broad; slightly notched. Teeth villiform; none of them enlarged; in bands which extend backward a little less than half the length of mouth; pharyngeal teeth bristle-like. Gill-opening not large; the lower edge an eye's diameter below base of pectoral; the width of isthmus slightly greater than depth of caudal peduncle. Gill-rakers on first arch 3+10; short and slender; the length of longest less than diameter of pupil. No protuberances on inner edge of shoulder girdle. Lower jaw without barbels. Anterior nostril with a conspicuous short tube, widened at its opening.

Head naked; the skin thick; not much wrinkled nor folded; preorbital with a fleshy flap which extends forward and downward below nostrils. A conspicuous line of pores extends from a point above and posterior to the nostrils forward, and then downward along upper edge of preorbital flap where it divides; one branch running backward below the eye and curving upward behind it; the other backward toward the middle of cheek. A similar line of pores lies on either side of lower jaw between the folds of skin. A large pore on interorbital space between posterior parts of eyes. Body with small, thin, cycloid scales, which are more or less deeply embedded in the skin. Anteriorly the scales are closely crowded and somewhat irregularly placed; on the breast and belly they are minute and almost hidden beneath the skin.

Dorsal fins well separated; height of longest spines about equal to length of snout; posterior spine connected with the back by a large triangular membrane; rays somewhat higher than the spines, the longest about equal to depth of caudal peduncle; no membrane connecting posterior ray with the back. Anal equal in height to spinous dorsal; when depressed the anal and dorsal extend an equal distance posteriorly, both falling short of bases of first caudal rays a distance equal to one-half the depth of caudal peduncle. Caudal rounded. Pectoral rounded; its upper edge with a fringe of 14 or 15 thread-like filaments, of which each ray except the uppermost contributes two. Ventrals short; free from body posteriorly; the membrane connecting the spines fleshy; elevated; its height equal to diameter of eye; its edge concave.

Color in spirits, dark above; the throat and belly light; head with indistinct dots above, and scarcely discernible bars on cheeks; sides of body with irregularly shaped small white spots, in which a transverse arrangement is suggested. Dorsal, anal, and caudal fins edged with white, the white of caudal forming a distinct band; membranes of fins with indefinite light spots; first dorsal with a large, round, white spot just behind last spine, where the membrane is black; caudal with a large black blotch at its base followed by a transverse row of small white spots, one on each ray. Pectorals and ventrals without spots except at the base of the former.

Length of the type, 100 mm.

Smaller specimens have the spots on top of head and the bars or spots on cheeks distinct; anterior parts of body with small, dark spots; sides with 8 or 9 transverse light-colored bands with small light blotches between them; in some cases the bands being broken up into elongate blotches. The dark caudal spot and the white terminal band are very distinct.

On the smaller specimens, a lateral line is suggested by a row of 29 groups of minute papillæ, extending along the middle of the sides. Each group has 5 or 6 papillæ in one, or occasionally two vertical rows, which are a little less than the width of a scale in length. A mere trace of the lateral line is seen on large specimens.

The specimen from Tsushima appears to have no light spots on the sides. The dark spot at base of caudal is scarcely perceptible.

This species is very abundant in the rock pools of the headlands of eastern Japan, from Tokio to Nagasaki. About Awa and Misaki it swarms in all the rock pools warmed by the Kuro Shiwo.

Measurements of Chasmias misakius.

Length in millimeters	115	100	99	95	80	79	61	53	49	51
Depth expressed in hundredths of length	19	20	18½	20	21	18	19	18	20	20
Depth of caudal peduncle	12	13	12	13	13	13	13	12	12	12
Length of head	33½	31	30	33	32	33	33	31	32	31
Length of snout	12½	12	12	12	11½	12	12	11	10½	11½
Width of interorbital space	8½	8½	7½	8½	8	8	7½	7	7	6½
Diameter of orbit	4½	4½	5	5	5	5	6	6	6½	6
Distance from snout to spinous dorsal	43	41	42	43	42½	42	44	42	42½	43
Distance from snout to soft dorsal	61½	61	62	62	61	61	61	61	61	61
Height of longest dorsal spines	11	12	10	11½	11	12	13	12	13	12
Height of longest dorsal rays	12	12½	10½	12	12½	12	14	16	13	14
Distance from snout to anal fin	66	65	67	65	66	65	67	67	65	66
Height of longest anal rays	11	11½	12	11	12½	12	13	13	15	14
Length of caudal peduncle	22	21½	21	22	22	22½	23	22	23	22
Length of caudal fin	21	22	22	21½	23	22½	24	25	26	23
Length of pectoral fin	18	19	20	21	20	19	22	23	22	21
Length of ventral fin	9	9	9½	10	10	10	12	12	14	12½
Number of dorsal spines	6	6	6	6	6	6	6	6	6	6
Number of dorsal rays	12	11	11	12	12	11	11	11	12	11
Number of dorsal anal rays	10	10	10	11	10	10	10	10	10	10
Number of pectoral rays	21	21	21	21	21	22	22	21	23	21
Number of scales in lateral series	92	89	88	91	85	81	90	92	89	......
Number of scales in transverse series	27	28	26	26	28	28	25	29	29	27

This species is the type of a distinct genus, *Chasmias*, related to *Gillichthys* and *Platygobius*. It may be thus defined:

Body moderately elongate, covered with minute, cycloid scales. Head broad, naked, flattish above, wide between the eyes. Mouth very large, horizontal, the upper jaw projecting; teeth in moderate bands; maxillary much produced backward, extending beyond the eyes; tongue broad, not notched; isthmus very broad, the gill-openings restricted to the sides; no barbels; shoulder girdle without fleshy flaps. Dorsal fins short, low, the first of six slender spines, caudal rounded; pectoral with free silky tips to the rays above; ventrals short and broad. Two species are known, the type, *Chasmias misakius* and the equally abundant *Chasmias dolichognathus*, of Hilgendorf, which is found all along the shore from Hakodate to Nagasaki, between tide marks.

72. CHÆTURICHTHYS STIGMATIAS Richardson.

This species, the habitat of which was heretofore unknown, is represented by two poorly preserved specimens collected at Sasuna, Tsushima, Japan. Richardson's specimens collected by the "Sulphur" were in a bottle labeled "Southern Pacific," but Richardson observes: "As the bottle held several species from the China Seas, there appears some doubt as to the native place of the fish." It probably came from China.

One of our specimens is here described.

Head 3⅝ in length; depth 7; depth of caudal peduncle 4¾ in head; eye 4⅔; snout 3⅛; maxillary 2; D. VIII–22; A. 19; P. 24; scales in lateral series about 57; in transverse series about 14.

Body elongate posteriorly, the dorsal and ventral contours sloping gradually to the caudal peduncle, which is narrow and compressed. Head large, wider than body, the width equal to distance from tip of snout to posterior border of eye.

Eyes high in head, oblong; directed obliquely upward, more of the eye being visible when viewed from above than when seen from the side. Interorbital space slightly concave. Mouth large, oblique; lower jaw projecting somewhat beyond the upper; lips thin; maxillary extending to a perpendicular through middle of pupil; entirely concealed beneath a pendulous dermal fold of the suborbital. Tongue broad, concave anteriorly. Teeth in two rows on each jaw, slender, pointed, and curved; those in outer row stronger and fang-like. Gill-opening extending far forward, the isthmus narrow. Three large papillæ on inner edge of shoulder girdle. Gill-rakers on first arch 3+11, long and slender. Lower jaw with three barbels on each side, the distance between them equal to the diameter of the orbit; anterior barbel shorter and thicker than the others.

Occiput, opercles, and preopercles with small, round, smooth scales, scarcely or not at all imbricated. Body with cycloid scales, small near the head, growing larger posteriorly.

Dorsal fins separate; the first 6 spines evenly spaced; the others farther apart. When depressed, the fin does not extend to insertion of soft dorsal. Dorsal rays growing higher from before backward; when depressed, reaching base of upper caudal rays. Anal inserted below base of third dorsal ray; the rays not reaching so far posteriorly when depressed as do those of the dorsal. Caudal long, pointed, with short accessory rays above and below (hence the name "chæturichthys"); short dorsal and ventral rays of the fin growing far forward on the caudal peduncle. Pectorals pointed, extending to vent. Ventrals free from body posteriorly, extending to a point below base of seventh dorsal spine.

Body without distinctive color markings. Spinous dorsal with a large black spot on its posterior border. Soft dorsal, caudal, and pectorals with indistinct dark wavy markings. Ventrals and anal without dark markings, except a little dusky on posterior border of latter.

Family BLENNIIDÆ.

73. ENEDRIAS NEBULOSUS (Schlegel).

45317. Tsushima.

Very common on all the coasts of Hondo.

74. DICTYOSOMA TEMMINCKI Bleeker.

No. 45316, U.S.N.M. Sasuna, island of Tsushima.

Common about rocks of Hondo and Kiushu. The rudimentary ventrals, each of a single scale-like spine, disappear with age.

Family BROTULIDÆ.

WATASEA Jordan and Snyder, new genus.

Type of genus, *Watasea sivicola* (*Brotulidæ*) Jordan and Snyder, new species. This genus is distinguished from *Sirembo* (*imberbis*) by having two spines on the preopercle and the ventrals bifid. In *Sirembo* the preopercle has no spines and the ventrals are reduced to slender, undivided filaments. From *Neobythites*, which is much more closely allied, *Watasea* differs in the presence of two stout spines on the preopercle. In *Hoplobrotula*, which is still closer, three stout spines on the preopercle are developed. *Marginatus* and perhaps other species hitherto referred to *Neobythites* belong rather to *Watasea*. The genus is named in honor of Dr. Sho Watase, formerly professor in the University of Chicago, now professor in zoology in the Imperial University of Tokyo.

75. WATASEA SIVICOLA Jordan and Snyder, new species.

(Plate XXXVII.)

Type.—No. 6375, L. S. Jr. University collection.

Locality.—Misaki, Sagami, Japan.

Collector.—Dr. K. Mitsukuri.

Cotype.—U. S. National Museum, from off Yokohoma (617). Coll., P. L. Jouy.

Head, 4¾ in length; depth, 5¾; eye, 4⅗ in head; snout, 4⅕; maxillary, 2½; D. 93; A. 74; P. 25; scales in lateral line, 100; between lateral line and insertion of dorsal, 11; between lateral line and insertion of anal, 30.

Body very elongate; the deepest part in the region of anal opening from where it slopes evenly to the narrow base of caudal.

Snout, blunt and short; its length equal to longitudinal diameter of eye. Interorbital space convex. Jaws equal. Mouth large, oblique. Maxillary extending beyond the orbit a distance equal to about one-half the vertical diameter of eye; the entire upper edge slipping under the suborbital; the distal end broad, its posterior edge concave. Lips thin, their surfaces smooth. Jaws, vomer, and palatines with broad bands of closely-crowded, minute, blunt teeth; the palatine bands nearly two times as wide as those of jaws. Tongue with a long and narrow patch of similar teeth extending from symphysis of the first to that of the third gill arch; a small oblong toothed area at symphysis of fourth arch, separating the lingual plate from the lower pharyngeal. Upper part of pharynx with five small toothed patches on each side. Floor of pharynx with two narrow toothed surfaces, united before, diverging backward. Pseudobranchiæ small, covering an area not much longer than the diameter of pupil. Gill-rakers on first arch 5 + 14; very long and slender near middle of arch; reduced to mere elevations toward the ends.

Dorsal surface of head with a V-shaped ridge; the apex above anterior edge of eye, the arms extending backward. A post-orbital ridge extending on each side parallel to the posterior parts of the first mentioned elevations. Upper rim of orbit with a slight ridge. Preopercle with two prominent flat spines projecting backward; the lower and larger at the angle; the other about one-half the diameter of eye above the lower opercle with a strong spine.

Head and body completely covered with small, oval, cycloid scales, which have minute striæ radiating from the center. Scales on maxillary very small. Membranes of dorsal and anal with minute scales. Lateral line extending along upper third of body, disappearing at a point about one-half the length of head from base of caudal.

Dorsal fins continuous with the caudal; the distance between tip of snout and insertion of dorsal equal to one and one-quarter times the length of head; the rays of both fins a little higher on the posterior than on the anterior parts, the tips *filamentous;* last rays extending about to middle of caudal fin. Caudal long and narrow; the base truncate; the tip pointed. Pectorals rather acutely rounded. Ventrals inserted close together; near anterior edge of humeral symphysis; the distance between their bases about equal to one-third the width of posterior edge of maxillary; each fin with two rays, parted for about half their length.

Color in spirits bluish white throughout.

The species is represented in the Jouy collection by a single individual (No. 49707, U.S.N.M.), which is very similar to the type. It is from off Yokohama, probably from the same type locality of Misaki.

Measurements of Watasea sivicola.

Length of body in millimeters	217	208
Depth of body expressed in hundredths of length	17½	17½
Length of head	21	21
Width of interorbital space	4⅓	4¼
Length of snout	4	4
Length of maxillary	10	10
Diameter of orbit	4½	4½
Distance from snout to dorsal fin	26	25
Height of rays near middle of fin	6	6
Distance from snout to anal fin	44	44½
Height of rays near middle of fin	4½	5⅓
Length of caudal fin	8	7½
Depth of base of caudal	1	1¼
Length of pectoral fin	12	12
Distance from snout to ventral fin	15	16
Length of ventral	14	14½
Number of rays in dorsal fin	93	92
Number of rays in anal fin	74	78
Number of rays in pectoral	25	26
Number of scales in lateral line	100	102
Number of scales above lateral line	11	11
Number of scales below lateral line	30	27

76. HOPLOBROTULA ARMATA (Schlegel).

(Plate XXXVIII.)

(*Brotula armata* Schlegel.)

Although this species is not represented in the Jouy collection, it will be of interest in connection with the genus and species just mentioned (*Watasea sivicola*) to record the character of a fine specimen 403 mm. long obtained at Nanaura, in Boshu, near Misaki. It was presented by the Imperial University of Japan to the Stanford University collection.

The genus *Hoplobrotula* differs from *Neobythites*, *Watasea*, and *Sirembo* in having three strong opercular spines, the maxillary and parts of the head naked, and the posterior upper part of the maxillary free from the suborbital. The ventral fins are bifid.

Head, 4⅜ in length; depth, 5¼; eye, 5⅞ in head; snout, 4⅙; maxillary, $1\frac{9}{10}$; D., 86; A., 74; P., 20; scales in lateral line, 112; between lateral line and insertion of dorsal, 9; between lateral line and insertion of anal, 27.

Interorbital space convex; its width equal to length of snout. Jaws equal. Snout blunt; almost truncate. Maxillary extending posteriorly far beyond the eye; the upper edge not covered by preorbital for the entire length; the distal end broad; the posterior edge slightly concave. Lips rather thick; their surfaces covered by minute epidermal flaps. Jaws, palatines, and vomer with minute, sharp, firmly embedded teeth in villiform bands; a toothed area extending from near tip of tongue to posterior part of pharynx; roof of pharynx with toothed surfaces similar to those of jaws. Gill-rakers on first arch, 4+15; those of the upper limb and all but five on the lower reduced to mere rounded elevations; the others short and flat.

Preopercle with three strong spines projecting through the skin, the lower one pointing downward, the upper pointing backward and downward. Opercle with an elevated ridge at its upper part, terminating in a strong spine.

Opercles, preopercles, and a narrow area on each side of occipital part of head with oblong, cycloid scales; other parts of head naked. Body covered everywhere with scales similar to those of head. Lateral line ending a distance from base of caudal about equal to length of head.

Dorsal and anal fins continuous with the caudal; the membranes fleshy. Dorsal inserted a distance behind tip of snout equal to one and one-fourth times the length of head. Caudal narrow; pointed. Pectorals pointed. Ventrals inserted close together near anterior edge of humeral symphysis; the fins reduced to bifid filaments, cleft to within the diameter of pupil from the base; inner filament the longer.

Color dusky; overlaid with silver. Posterior halves of dorsal and anal dusky, the color near the ends becoming dark chestnut; the edges lighter. Caudal same color as the neighboring parts of dorsal and anal.

This species is known from Schlegel's account of a specimen in bad condition, and from a specimen taken near Tokio, described by Steindachner and Döderlein.

Measurements of Hoplobrotula armata.

Length of body in millimeters	374
Depth of body expressed in hundredths of length	19
Length of head	22
Width of interorbital space	5¼
Length of snout	6
Length of maxillary	11
Diameter of orbit	4
Distance from snout to dorsal fin	27¼
Height of rays near middle of fin	7
Distance from snout to anal fin	42
Height of rays near middle of fin	7½
Length of caudal fin	8
Depth of base of caudal	1¼
Length of pectoral fin	15¼
Distance from snout to ventral fin	11
Length of ventral	13¼

Family GADIDÆ.

77. LOTELLA PHYCIS Schlegel.

Yokohama.

Common in rather deep water off the east coast of both Hondo and Kiusiu.

78. PHYSICULUS JAPONICUS Hilgendorf.

(*Physiculus dalwigki* Steindachner, not of European writers.)

Yokohama.

In deep water, not very common.

Family PLEURONECTIDÆ.

79. KAREIUS BICOLORATUS (Basilewsky).

(*Pleuronectes scutifer* Steindachner.)

Yokohama.

Generally common off northern Hondo and Hakodate.

80. PLEURONICHTHYS CORNUTUS (Schlegel).

Yokohama.

Common throughout Japan in sandy bays.

81. ZEBRIAS ZEBRA (Bloch).

564. Yokohama.

The Japanese species, *Zebrias zebrinus* (Schlegel), is not evidently different from the Chinese form, *Zebrias zebra*

Family LOPHIIDÆ.

82. LOPHIOMUS[1] sp. indescr.

611. Yokohama.

Not rare in water of moderate depth.

Family ANTENNARIIDÆ.

83. ANTENNARIUS TRIDENS (Schlegel).

Yokohama.

Everywhere common in sandy or muddy bays and inlets.

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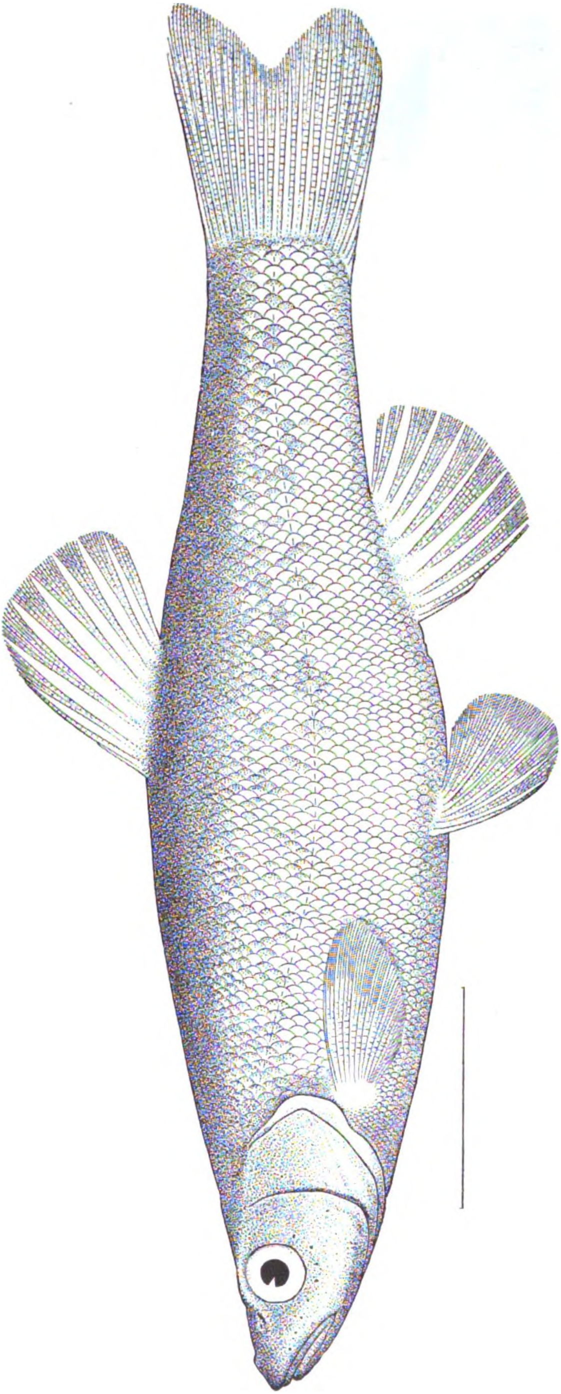
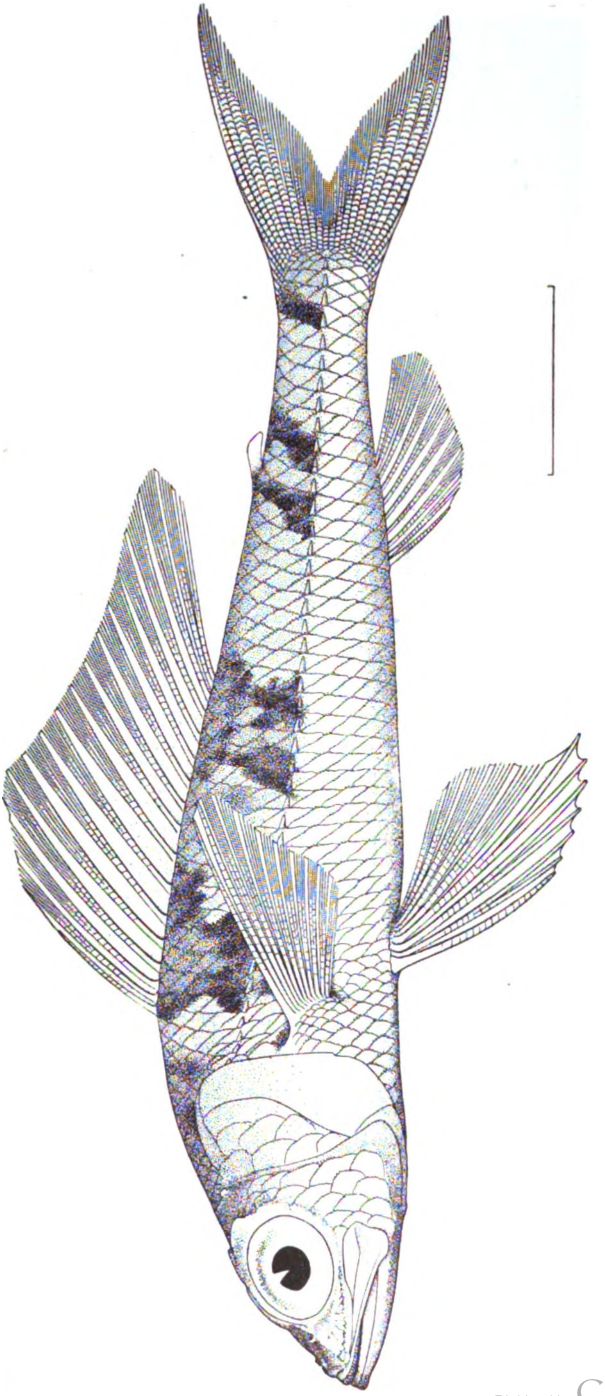
[1] This specimen proves to belong to a species distinct from *L. setigerus* Vahl, to be described later.



LEUCISCUS JOUYI.

FOR EXPLANATION OF PLATE SEE PAGE 741.



AULOPUS JAPONICUS.

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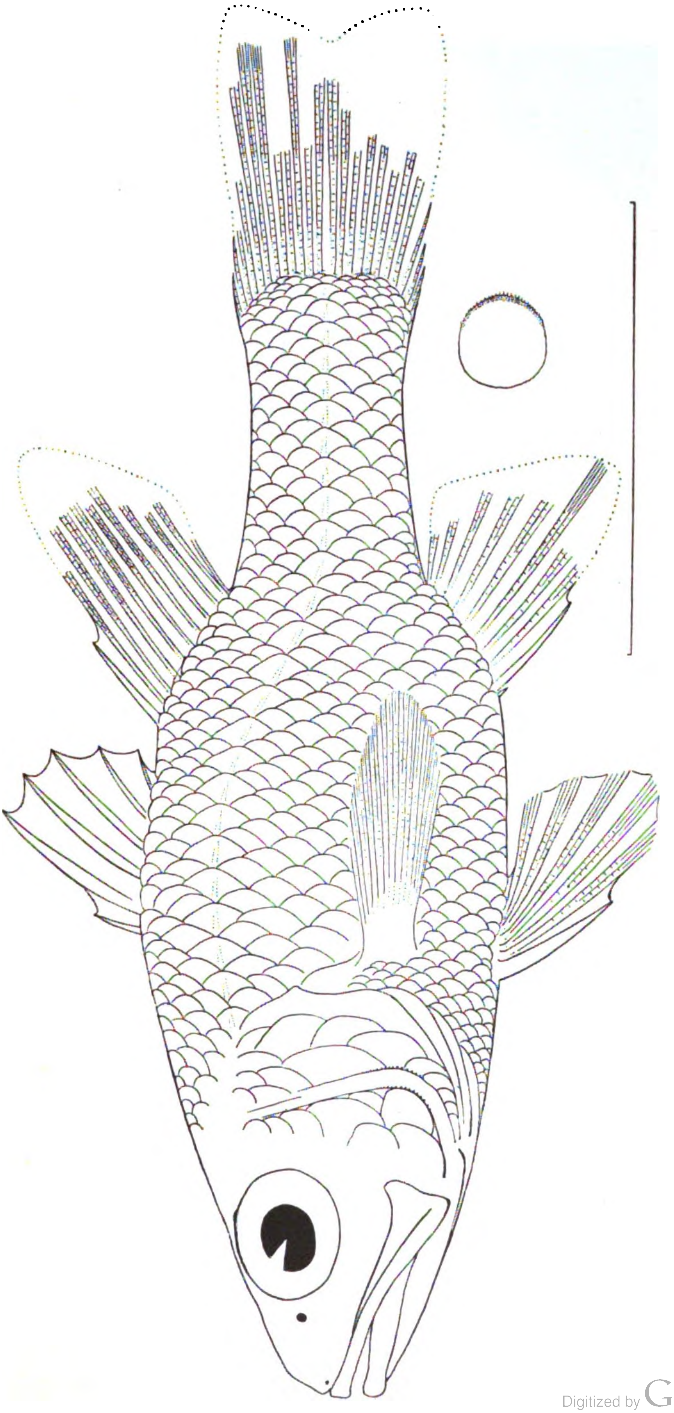

APOGON UNICOLOR.

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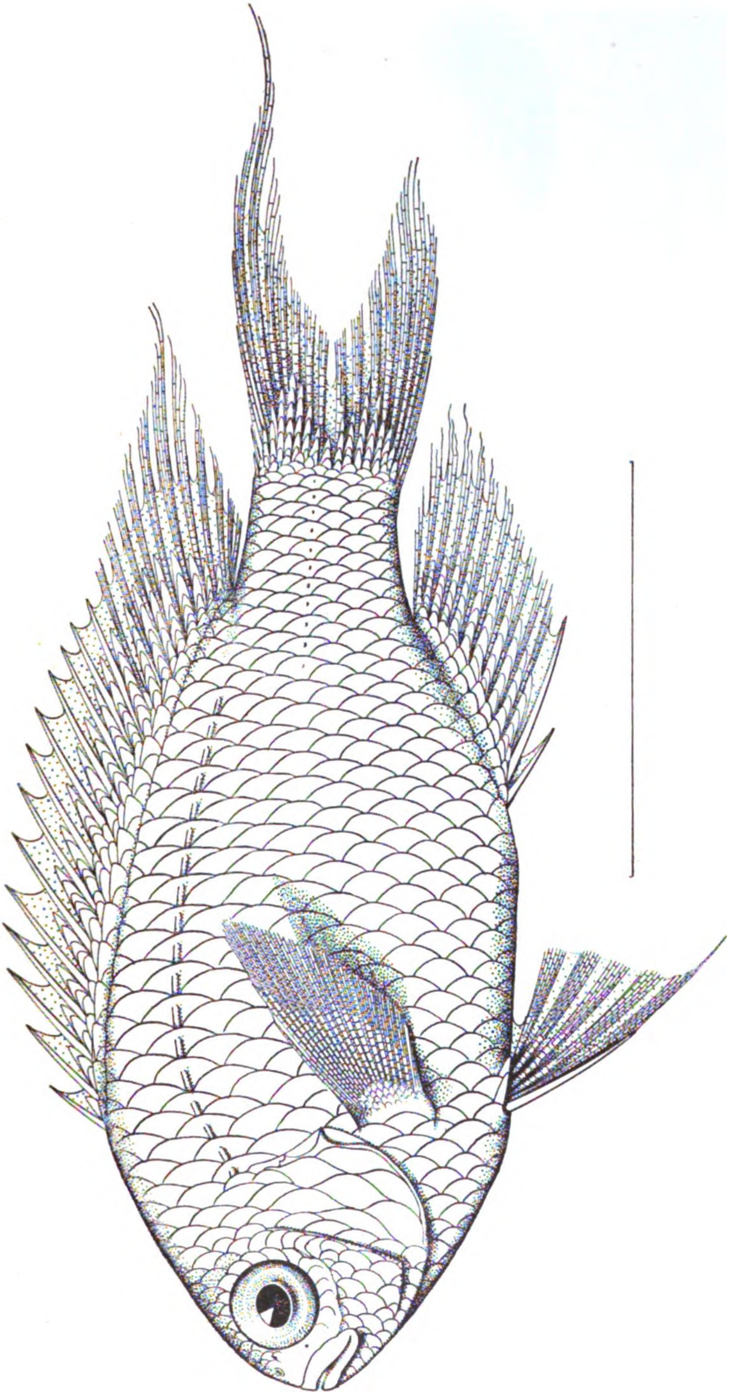

POMACENTRUS RATHBUNI.

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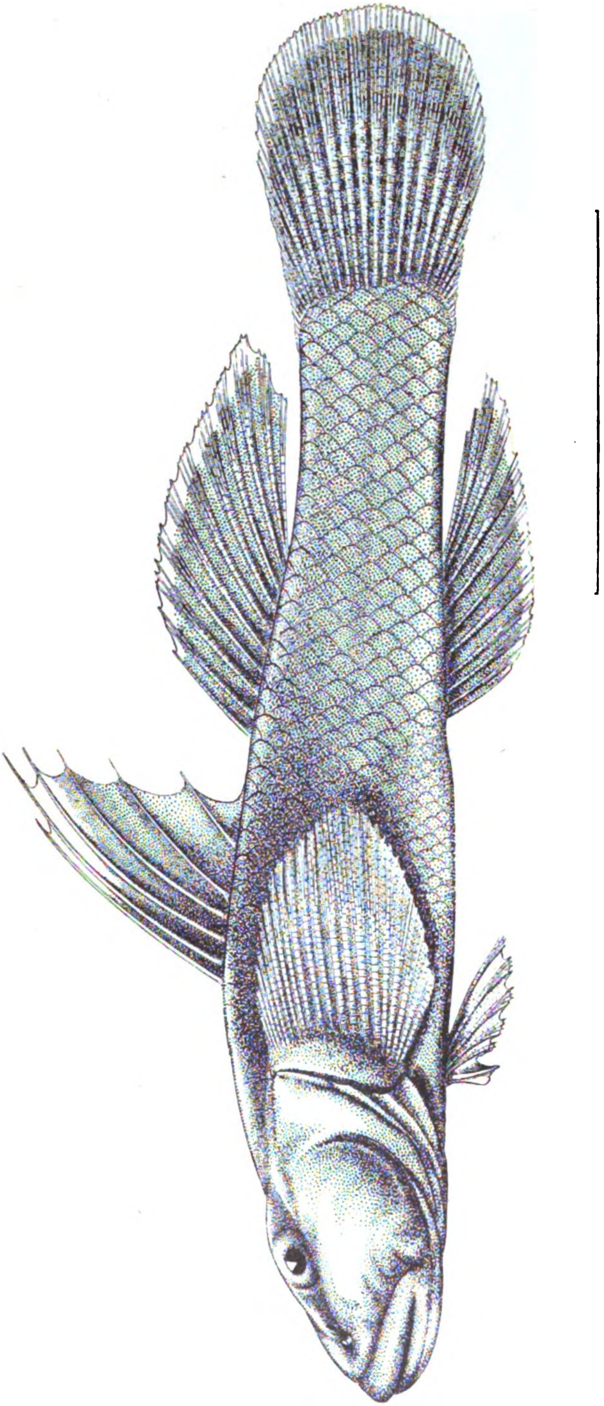

CTENOGOBIUS SIMILIS.

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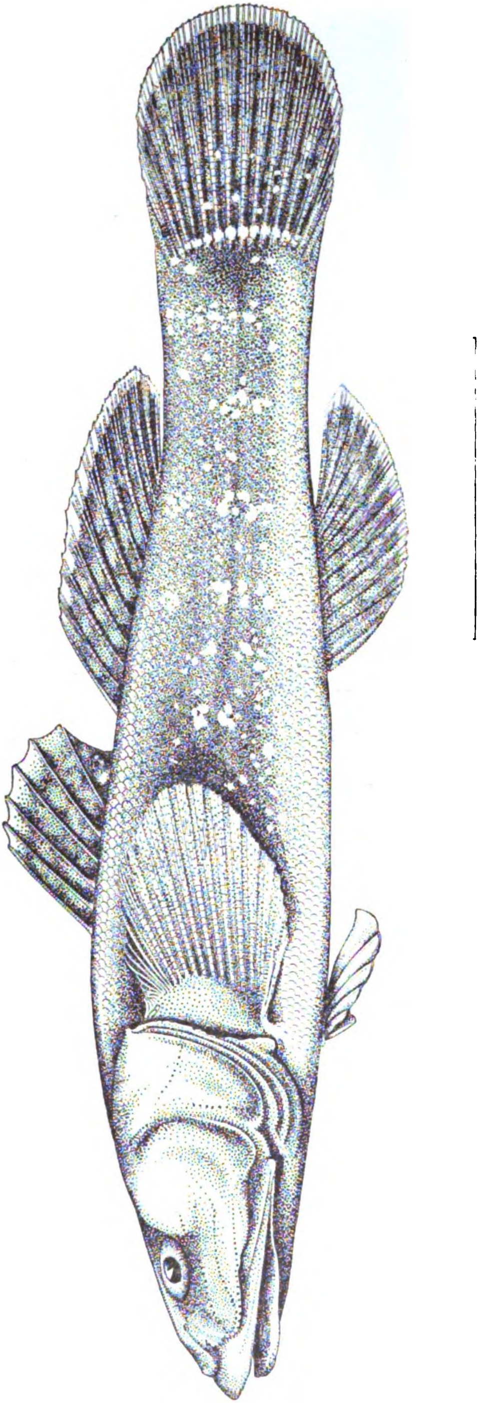

CHASMIAS MISAKIUS.

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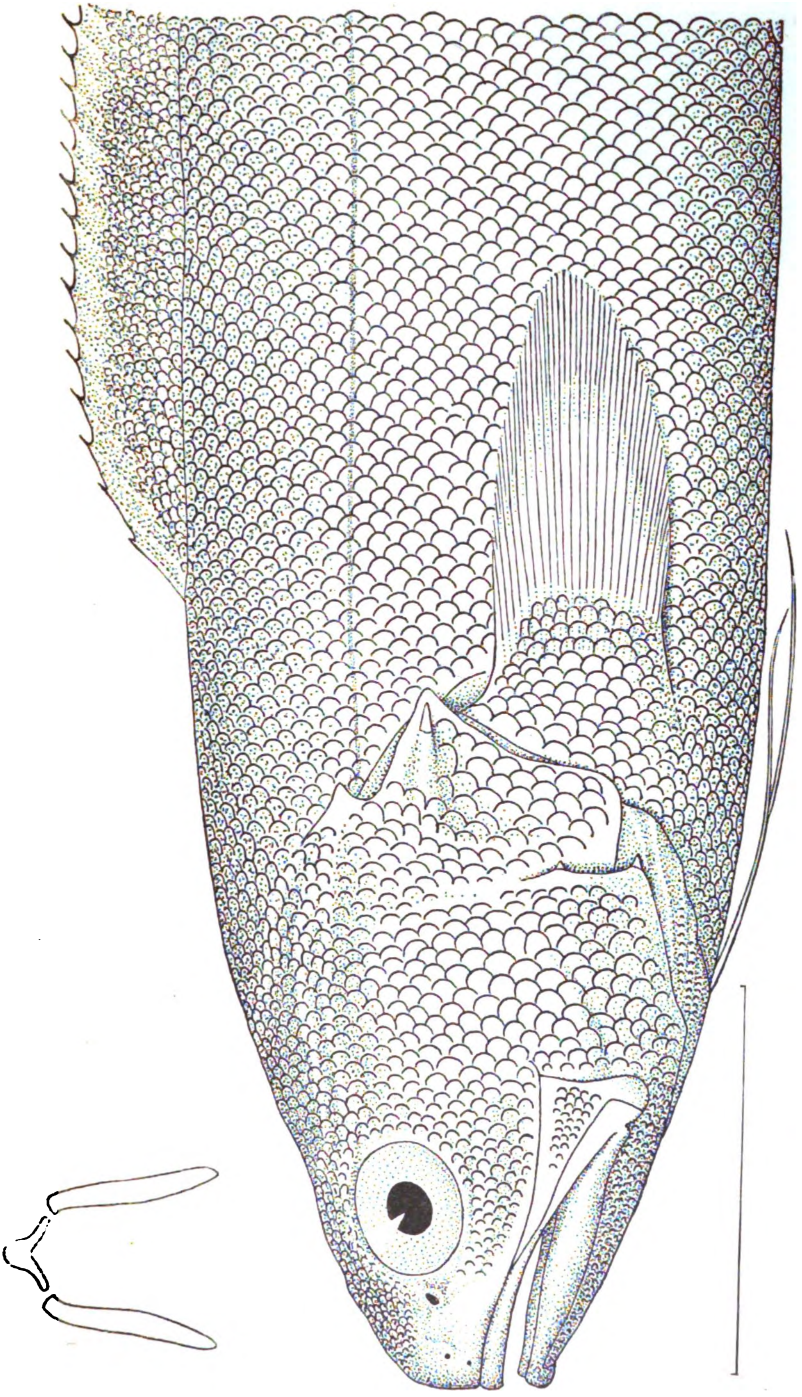

WATASEA SIVICOLA.

FOR EXPLANATION OF PLATE SEE PAGE 765.

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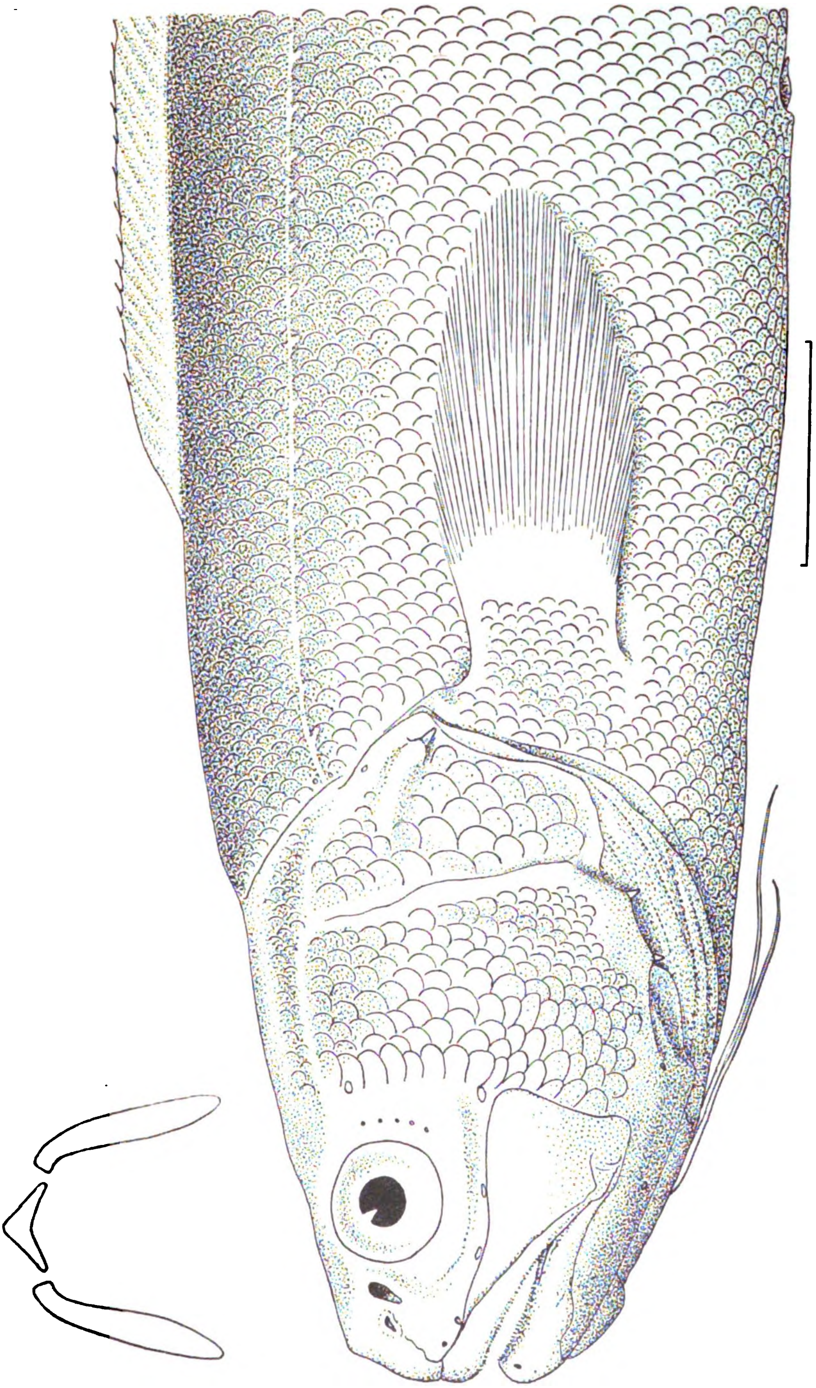

HOPLOBROTULA ARMATA.

FOR EXPLANATION OF PLATE SEE PAGE 767.

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FOUR NEW SYMMETRICAL HERMIT CRABS (PAGURIDS) FROM THE WEST INDIA REGION.

By James E. Benedict,
Assistant Curator, Division of Marine Invertebrates.

The specimens described in this paper were all dredged by the U. S. Fish Commission steamer *Albatross* in 1885, and all belong to the West India region, with the possible exception of *Mixtopagurus gilli*, which was taken in 107 fathoms off North Carolina, the extreme northern limit of the region.

The symmetrical Pagurids are regarded as approximating the macruran type more closely than the other members of the family. The relationships of *Pylocheles* and *Mixtopagurus* and other forms with calcified dorsal abdominal plates are discussed by A. Milne-Edwards and Bouvier in the *Blake* Pagurids.[1]

Cancellus Edwards is a well characterized genus. The door or cover to its dwelling is formed by the facets of the chelipeds and of the first pair of ambulatory legs, which are much modified for this purpose. The abdomen in the three species before me is spherical, as is also that of *Cancellus typus* Edwards and of *Cancellus tanneri* Faxon; the only exception to this structure is furnished by the *Cancellus canaliculatus* (Herbst), which is figured with a conventional abdomen. The abdomen in this genus seems to be even more readily separated from the thorax than in other genera, and this separation had not unlikely taken place in Herbst's specimen and the conventional form may have been added to the figure for the sake of completeness. A notable case of the substitution of a wrong part occurs also in Herbst's famous work,[2] where his *Cancer megistos* is shown with the abdomen of a macruran.

The *Mixtopagurus* described shows an interesting variation from the type species of the genus in having a decidedly unsymmetrical telson.

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[1] Mem. Mus. Comp. Zool. XIV, No. 3.

[2] Plate LXI, fig. 1.

CANCELLUS ORNATUS, new species.

The rostral projection is a broad triangle with a rather blunt apex; the sinus on either side behind the eyes is deep and evenly rounded; a broad raised collar extends from the outer limit of one to the outer limit of the other sinus; from these points to the antero-lateral angle the margin is straight and transverse, giving the entire front a transverse effect. The eye-stalks are slender and reach to the operculating facets; in the distal half of their length they are straight and nearly in contact; in the proximal half they are spreading.

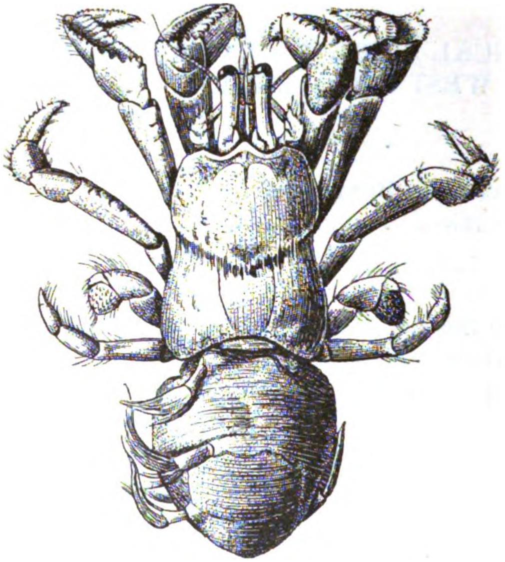
FIG. 1.—CANCELLUS ORNATUS. × 2¼.

The peduncles of the antennulæ reach the cornea. The peduncles of the antennæ extend to about the middle of the eye-stalk; the flagellum is small and short, extending a little if any beyond the distal margin of the carpus. The acicle of the antenna is short, stout, and subdiamond-shaped; three stout but short spines arm the outer and one the inner margin.

The anterior portion of the carapace is much broader than long, and is strongly arcuate at the sides; a transverse sulcus runs along just behind the collar or carina of the frontal margin, broadening out into a diamond-shaped depression behind the rostrum and a triangular depression behind the sinus.

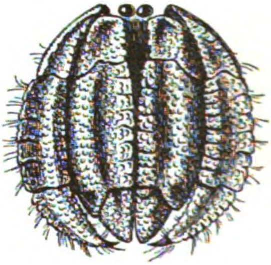
FIG. 2.—OPERCULUM OF CANCELLUS ORNATUS. × 3¼.

The exposed surface of the carpus of the chelipeds forms a deeply excavated facet in the plane of the palm; the excavation forms a part of a channel, which extends to the base of the fingers. The raised margin of the carpus is thin and thickly set with spiny granules; the margins of the palm are much thicker and the granules are not so spiny in character; the inner margins of the palms are straight; between this contact margin and the channel the raised surface is divided into lobes by transverse cuts; each lobe is crowded with large granules.

The outer margins of the palms are not divided into lobes, but the granules are arranged in more or less regular transverse rows; the margin is not abrupt; the upper surface rounds gradually into the side; against this rounded portion the first pair of ambulatory legs fit and rest firmly; the movable finger is short and stout; the surface is crowded with granules; it is evenly rounded with the exception of a slight depression near the articulation.

A channel on the facets of the ambulatory legs begins at the proximal margin of the carpus and ends on the dactyl a little beyond the middle; the inner margin of the palm is divided into lobes, each of which has a double row of granules, except the terminal one, which has four or more. The outer margin is deeply cut into lobes, which are well separated at the base and are in contact at near the thin edge; these foliaceous lobes appear as if built up of granules. The abdomen is spherical; the plate of the sixth segment is divided by a transverse carina; the anterior portion is subdivided by a median notch and a deep groove which widens out into a large pit at the carina; the margin is spiny. The arrangement of spines is as follows: A group of four on one side of the notch and six on the other; a single large spine is placed near the carina; between this spine and the groups at the notch are two spines which arise from a single base; the posterior part of the plate begins with a deep groove, which reaches from side to side next the carina; the posterior margin is truncate, with a notch near the angles; two or three small tubercles are placed near the notches; the angles and sides are ornamented with a number of similar tubercles. The telson is truncate and has a large lobe on the side.

A single female 25 mm. in length, without eggs, station 2405, Gulf of Mexico, 28° 45′ 00″ north latitude, 85° 02′ 00″ west longitude, in 30 fathoms. Unfortunately the specimen is without its dwelling.

Type.—U.S.N.M. No. 9784.

Cancellus ornatus seems to be more closely related to *Cancellus tanneri* than to any other described species; from this it may be readily separated by its triangular rostral projection and many other characters examined in detail. The enlarged coxal segments of the fifth pair of feet are closely like those of *C. tanneri;* this character separates it from *C. typus* Edwards.

CANCELLUS SPONGICOLA, new species.

The angle of the rostral projection in this species is closely like that of *Cancellus ornatus*, with the exception that the apex is a little more acute. The sinus behind the eyes is not bordered by a collar-like carina, and the margin and the antero-lateral angle is rounded. The eyes, as in *Cancellus ornatus*, reach the plane of the operculating facets. The antennular peduncles pass the eyes a very little. The peduncles of the antennæ reach the middle of the eyestalks. The acicle is like that of *Cancellus ornatus*.

The depressions of the sides of the carapace are strong; the central part is smooth; it is broader than long—broadest a little behind the middle.

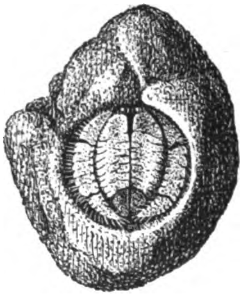

FIG. 3.—CANCELLUS SPONGICOLA IN SPONGE. × 1¼.

The carpal facets of the chelipeds are slightly concave; the facets of the palms taken together are convex, though a slight depression extends down from the carpus of each; the fingers are very short, the tips are coal black; the facets of the first pair of ambulatory legs are all slightly convex, and, as is common in the genus, the operculating surfaces are divided into lobes by transverse sutures. The sutures do not extend across the facets; on the chelipeds the sutures are closed, while on the propodus and dactyl of the ambulatory legs they are open on the outer margin and closed on the inner. The entire opercular surface is crowded with depressed granules; both margins of the ambulatory legs are well set with bristles.

The abdomen is spherical. The plate of the sixth segment, as in *Cancellus ornatus*, is divided transversely by both a carina and a channel; the anterior half has an evenly rounded margin armed with spines. Bunches of hair are scattered over its surface. The posterior part is short, and is armed with much smaller tubercles than is the other species.

The under surfaces of the ambulatory legs are mottled with orange and white; the other parts are a light straw color.

The specimen is a male, about 22 mm. in length, taken at station 2354, 20° 59′ 30″ north latitude, 86° 23′ 45″ west longitude, 130 fathoms. Its carcinœcium is a firm siliceous sponge.

Type.—U. S. N. M. No. 9549.

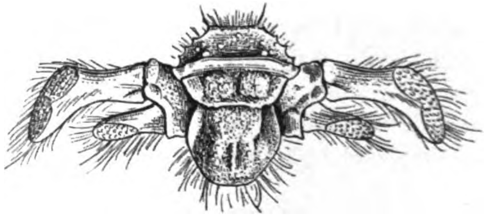

FIG. 4.—CANCELLUS SPONGICOLA. EXTREMITY OF ABDOMEN. × 8.

Cancellus spongicola is more nearly related to *C. parfaiti* Milne-Edwards and Bouvier than to any other species. A small specimen of the latter shows the palms more deeply excavated and with the inner margins a little more raised and more distinctly cut into lobes. The triangular median projection of the front has a distinct raised margin, which is altogether wanting in *spongicola*. The dactyls of the first pair of ambulatory feet are nearly smooth, not lobed as in *C. spongicola*.

PYLOCHELES PARTITUS, new species.

The frontal line of the carapace is made up of a short, straight line, in the middle ending in a short, sharp tooth. This is followed by an angular sinus, with a slightly carinate margin. This sinus ends at the outer line of the eye. Its terminus is marked by a small spine. Beyond this point the margin is straight for the width of the antenna, and runs diagonally back to where it rounds into the side. The eyestalks are stout, straight to the middle, where they expand to the moderately dilated cornea. The eye scales are simple rounded plates. The peduncles of the antennulæ are nearly twice as long as the eyes; the terminal segment and the greater part of the much longer preceding segment extending beyond. The peduncle of the antenna reaches the base of the cornea. The acicle is straight on the inner side, its margin being in line with the point of the terminal. A little below this spine, on the outside, is another spine, which forms a fork with it. At an equal distance below this is a third spine of equal size. Between this and the base the margin is concave. The armature of the inner margin consists of a comb of twelve or thirteen sharp spinules, which stand perpendicular to the axis of the acicle.

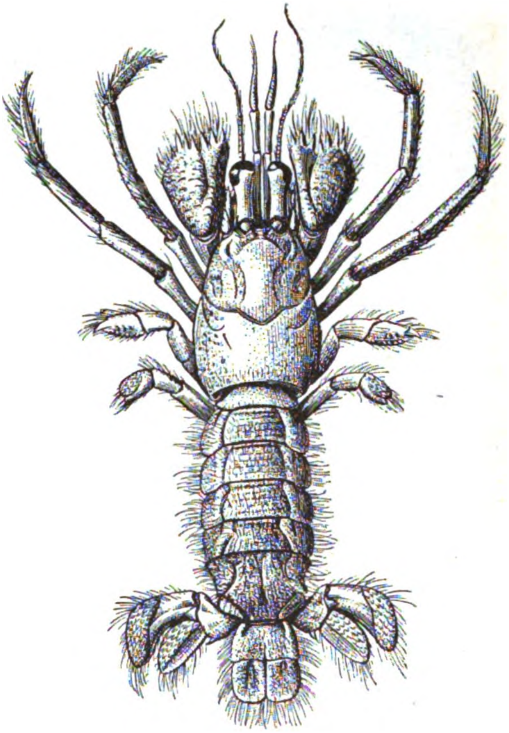
FIG. 5.—PYLOCHELES PARTITUS. × 2.

The middle area of the anterior portion of the carapace is spool shaped and is bordered by bunches of bristles; the sides of this portion are cut by irregular depressions. The posterior portion is calcified.

The chelipeds are bent downward as in *Cancellus;* the anterior margin of the carpus is raised in the form of a spiny crest, the spines forming a continuous row with those of the hand; the summit of the crest is armed with six spines divided into groups of three by a deep notch; the largest spine is the third from the notch on the outside; the others are equal or subequal; from the large spine the margin slopes rapidly to the hand; the direction of the crest is perpendicular to the plain of the hand. A sulcus runs along the ridge of the carpus into the notch. The palm is broad arcuate on the outside, straight on the inside; the surface is flat. The largest spines are on the inside margin of the palm; there are three spines on the dactyl near its base; beyond this the margin is granular rather than spiny. Scattered over the surface of the hand are numerous but well separated bristle-bearing granules; behind the fingers the granules are arranged in more or less regular rows; elsewhere the granules are more numerous and irregular. The exposed surfaces of the hand and the crest of the carpus are well covered with stiff bristles.

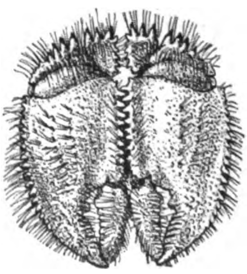

Fig. 6.—Operculum of Pylocheles partitus. × 3.

The segments of the abdomen are slightly calcified and very hairy. The telson is about as in *Pylocheles agassizii* Milne-Edwards, except that the articles are markedly longer in proportion than are shown in the figures of that species.

Type.—One specimen, a male, is labeled "Cozumel in a sponge Jan. 29th, 1885, *Albatross*", U.S.N.M. No. 9892. Length, 45 mm. from the end of the chelipeds to the end of the telson. Length of the carapace 10 mm. Length of the abdomen to the end of the telson 20 mm. U.S.N.M. No. 9901.

A second specimen, a female, was taken by the U. S. Fish Commission steamer *Albatross* off Habana, station 2348, 23° 10′ 39″ north latitude, 82° 20′ 21′ west longitude, in 211 fathoms. Length of carapace 7.5 mm.

This species is closely related to *Pylocheles agassizii* A. Milne-Edwards. A comparison of the specimens with the plate[1] brings out the following strong characters by which they may be separated:

In *Pylocheles agassizii* the projections of the front are weak. The sinus behind the eye is shallow and evenly rounded. The acicle is figured as broad and notched or toothed on each side, while in *Pylocheles partitus* the acicle is narrow and has but three spines, including the terminal spine. The spinules of the inside margin are so small that they can not be well made out without a lens. The carpal crests differ greatly in shape. *Pylocheles agassizii* has no notch nor has it a sulcus running along the upper margin of the carpus.

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[1] A. Milne-Edwards et E. L. Bouvier, Mem. Mus. Comp. Zool., XIV, No. 3, p. 20, pl. I, April, 1893.

MIXTOPAGURUS GILLI, new species.

The rostral projection of this species is a broad, low, evenly rounded lobe bordered by a narrow carina; the sinus behind the eye is shallow and evenly curved; it ends, as is usual in the family, at the triangular projection between the eye and antenna; these projections are a little in advance of the rostral lobe and terminate in a sharp point. Close examination of the lobe shows it to be armed with a single very small spinule which does not deflect the bordering carina in the least. The length of the eye laid off on the front reaches from the outer base of one antenna to the outer base of the other. The peduncles are cylindrical and slightly bow upward. From the middle they very gradually increase in size to the not otherwise dilated cornea. The

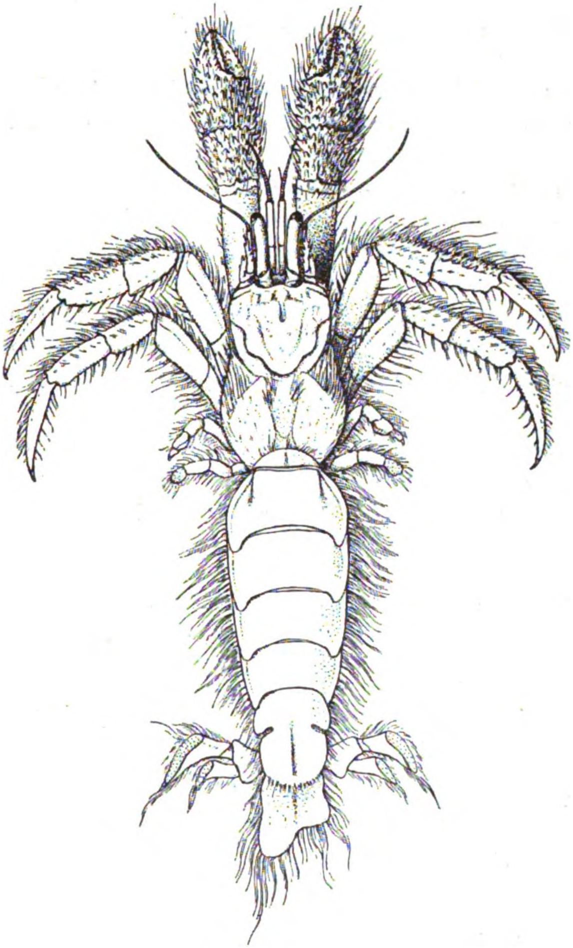

FIG. 7.—MIXTOPAGURUS GILLI. × 1⅓.

peduncles of the antennulæ extend beyond the eyes by about one-quarter of the length of the distal segment. The peduncles of the antennæ are three-fourths as long as the eyes. The basal article is armed with a single spine on the outer side, the second segment by a single spine near the base of the eye, and an elongated process with a terminal and three other spines on the outer side. The acicle is about twice as long as this process, and is armed with five spines on the inner side, by a terminal spine and by three spines on the external margin.

Mixtopagurus gilli differs from *M. paradoxus*, A. Milne-Edwards,[1] in the character of the front, which in that species is sharp and produced and is described as being more prominent than the lateral points. The antennular peduncles do not reach the corneæ, while in *Mixtopagurus gilli* they pass them. The chelipeds are quite different in proportion. The telson in *Mixtopagurus paradoxus* is symmetrical, in *M. gilli* very unsymmetrical.

The central areolation of the anterior portion of the carapace is shield shaped and smooth, the other parts of this portion are cut up by depressions. The posterior portion and the plates of the abdomen are calcified.

The chelipeds are short and stout; the inner and anterior margins are spiny; short conical spines are scattered over the surface. The crest of the palm has a row of six large spines; smaller ones are scattered over the surface; the movable finger has two rows of spines above.

The first right ambulatory leg has its carpus and propodus armed with a row of spines on the upper margin; there are two on the base of the dactyl; in the other ambulatory feet the spines are confined to the carpus. All of the feet are hairy.

The segmental plate of the sixth segment of the abdomen is armed with a row of spines on its distal margin. The telson is very unsymmetrical. It is fringed with long hair.

A single female with eggs was dredged at station 2601, 34° 39′ 15″ north latitude, 75° 33′ 30″ west longitude, in 107 fathoms. The anterior portion of the carapace is 8 mm. long.

Type.—U.S.N.M. No. 24805.

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[1] A. Milne-Edwards and E. L. Bouvier, Mem. Mus. Comp. Zool., XIV, No. 3, p. 24, pl. II, 1893.

SYNOPSIS OF THE LUCINACEA AND OF THE AMERICAN SPECIES.

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The present paper is a continuation of the series of synopses of various groups of our marine bivalve shells, of which the Leptonacea, Solenidæ, Tellinidæ, and Cardiidæ have already appeared in these Proceedings,[1] and other groups have been similarly treated elsewhere.

The Lucinacea is a fairly homogeneous group of families, apparently of very ancient lineage if the Silurian type referred to it is really akin. Mesozoic forms certainly occur, and, in the Tertiary, they are more numerous, more varied, and of greater size than in the recent fauna.

These papers make no attempt to review subordinate groups older than the Tertiary which are not represented in the Tertiary or recent faunas. The older groups require more time and material than is at the writer's disposal to treat them with thoroughness. On the other hand, most of the Tertiary genera are represented in the recent fauna, and some light on their affinities in doubtful cases can be gained from existing types.

The systematic arrangement of the Lucinacea, especially that of the typical family, is exceptionally confused, as it is more than half a century since the group, as such, has been revised even among the recent species, and makers of manuals seem to have accepted current statements with more than usual good nature. Many of the most common species go by names to which a very superficial examination would show they have no sufficient claim, and the manner in which unlike things have been lumped together is quite surprising.

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[1] Synopsis of the Recent and Tertiary Leptonacea of North America and the West Indies. Proc. U. S. Nat. Mus. XXI, pp. 873–897, with plates LXXXVII, LXXXVIII (No. 1177), June, 1899.

Synopsis of the Solenidæ of North America and the Antilles. Proc. U. S. Nat. Mus. XXII, pp 107–112 (No. 1185), October, 1899.

Synopsis of the Family Tellinidæ and of the North American species. Proc. U. S. Nat. Mus. XXIII, pp. 285–326, with plates II–IV (No. 1210), November, 1900.

Synopsis of the Family Cardiidæ and of the North American species. Proc. U. S. Nat. Mus. XXIII, pp. 381-392 (No. 1214), December, 1900.

Most of the older names have been treated with indifference, and the same group has several times received a succession of names from authors who did not investigate the history or literature relating to it.

While it would be too much to expect that the present revision is absolutely free from error, it is believed that it takes a considerable step in advance over anything now published, and will at least direct attention to a very interesting group of Pelecypods.

The families included in the present revision are as follows:

THYASIRIDÆ.

Both coasts; 35 species in all. East coast, 28; west coast, 11.

DIPLODONTIDÆ.

Both coasts; 20 species. East coast, 13; west coast, 9.

LUCINIDÆ.

Both coasts; 63 species.

CORBIDÆ.

Exotic? (Eastern Tertiaries.)

CYRENELLIDÆ.

East coast; 2 species.

All of these except the penultimate are represented in our recent fauna, and all in our Tertiary fauna. There are in all 120 species, of which 81 belong to the Atlantic, 45 to the Pacific, and only 5 (or possibly 6) are common to the two sides of the continent. The relative richness of the Atlantic coast is very marked, but of the Pacific species a large proportion, though not actually identical, are at least closely representative of Atlantic species, and doubtless are derived from a not remote common ancestor. As regards the Tertiary species, it may be said that, while nearly every recent group or species has its fossil analogue, we find as we recede in time, especially in the Eocene, a tendency for the subdivisions to coalesce or at least to lose their distinctive features and exhibit a mutability of character which, from the law of evolution, is exactly what we ought to expect. Contrary to my own anticipations, the superficial and ornamental characters are those which appear to be most strongly conserved from one horizon to another, through a series of geological epochs. Such features frequently come down from the Cretaceous or Lower Eocene with practically no change.

After satisfying myself that there was no mistake in this generalization, I concluded that this might be accounted for on the hypothesis that these characters, mostly due to trifling mutations of the armature of the mantle edge, are so little connected with essentials in the lives of these animals that, having been once acquired, natural selection has little or no influence upon them, and therefore rarely sets up any tendency to change.

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Family THYASIRIDÆ.

(*Cryptodontidæ* of authors.)

Genus THYASIRA Leach.

This is *Thyasira* Leach (in Lamarck, 1818); *Thyatira* Jeffreys, 1839, not Hübner, 1816; *Bequania* Leach (in Brown, 1827); *Axinus* J. Sowerby, 1821, not *Axina* Kirby, 1817; *Cryptodon* Turton, 1822; *Clausina* Jeffreys, 1847, not Brown, 1827; *Ptychina* Philippi, 1836; *Cryptodon*[1] (Turton) Dall, 1889, not of Conrad, 1837; *Schizothærus* Locard, 1898, not of Conrad, 1853; *Philis* Fischer, 1861; *Conchocele* Gabb, 1866; *Megaxinus* Brugnone, 1881; *Axinulus* Verrill and Bush, 1898; *Axinodon* Verrill and Bush, 1898; and *Lucina* (sp.) of various earlier authors.

The genus is divisible as follows:

Section *Thyasira* s. s.

Valves with edentulous hinge, the anterior dorsal area more or less impressed, the posterior more or less distinctly radially sulcate or plicate.

Type, *Tellina flexuosa* Montagu, 1803, + *Venus sinuosa* Donovan, 1801, not of Pennant, 1777; + *Lucina sinuata* Lamarck, 1818; + *Ptychina biplicata* Philippi, 1836; + *Cryptodon bisinuatus* S. Wood, 1840; + *Axinus sinuatus* Philippi, 1845. North Atlantic south to the Azores and Mediterranean.

Philis Fischer, intergrades with the other species. *Megaxinus* Brugnone, differs only by more solid shell and larger nymphs.

Section *Axinulus* Verrill and Bush, 1898.

Shell minute, ovate or oblong, with the dorsal areas obsolete.

These forms intergrade imperceptibly with those of the previous section; *Axinodon* Verrill and Bush, appears to differ by no substantial characters.

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[1] "*Cryptodon*" *moseleyi* and *luzonicus* Smith, do not belong in this family and their place is uncertain.

Genus AXINOPSIS G. O. Sars, 1878.

Valves with one or more cardinal teeth; shell small, solid, with no posterior dorsal area or plication, usually suborbicular.

Type, *A. orbiculatus* Sars, 1878; not *Lucina orbiculata* Montagu, 1808 (as *Venus*); + *Kellia orbicularis* Friele, 1877, not of Searles Wood, 1853.

Genus LEPTAXINUS Verrill and Bush, 1898.

Shell like *Axinulus*, but with distinct lateral teeth.

Type, *L. minutus* Verrill and Bush, 1898.

? Genus LUDOVICIA Cossmann, 1887.

Valves rounded-triangular, subcompressed, edentulous, with minute prominent umbones.

Type, *L. squamula* Cossmann, 1887, Parisian Eocene.

It is possible that further researches may render it advisable to include *Montacuta* in this family.

SPECIES OF THE EAST AMERICAN COAST.

THYASIRA INSIGNIS Verrill and Bush (as Cryptodon), 1898.

Grand Banks of Newfoundland to Cape Cod, Massachusetts, in 65 to 471 fathoms.

Cryptodon Sarsii Verrill, 1880, not of Philippi, 1845, is synonymous.

THYASIRA OVOIDEA Dall (as Cryptodon), 1889.

Off Cape Fear, North Carolina, in 563 fathoms.[1]

THYASIRA GRANDIS Verrill (as Cryptodon), 1885.

From latitude 38° 29′ north, south to Yucatan Straits, on the American coast in 856 to 1,582 fathoms. Also on the coast of France in 820 fathoms.

Cryptodon pyriformis Dall, 1886, and *Schizothærus grandis* Locard, 1896, are synonymous. The application of the name *Schizothærus* to this species by Locard doubtless grew out of a confusion of *Cryptodon* Conrad, 1837 (= *Schizothærus* Conrad, January 31, 1853, = *Tresus* Gray, January 1, 1853) with *Cryptodon* Turton, 1822.

THYASIRA GRANULOSA (Jeffreys as Axinus) Monterosato, 1874.

Gulf of Mexico to Santa Lucia Island, West Indies, in 60 to 116 fathoms. Also Mediterranean, Bay of Biscay, and Canaries, in 49 to 645 fathoms.

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[1] Figured in Proc. U. S. Nat. Mus., XII, pl. XIV, fig. 3.

Axinus orbiculatus Jeffreys, 1881 (not *Axinopsis orbiculatus* Sars, 1878) is synonymous. Its identity with the Sicilian fossil *Verticordia orbiculata*,[1] although claimed by Jeffreys, is very doubtful, and Jeffreys' figures of the sculpture are probably taken from the fossil and not from the recent shell, agreeing much better with the former and not at all with the surface of his types in the U. S. National Museum.

THYASIRA PLICATA Verrill (as Cryptodon), 1885.

Off Marthas Vineyard, Massachusetts, in 1,073 to 1,122 fathoms.

THYASIRA GOULDII Philippi (as Axinus), 1845.

Greenland to Stonington, Connecticut, in 5 to 400 fathoms; also on the west coast of America in Bering Sea, south of Bering Strait, and southward to the Queen Charlotte Islands.

Lucina flexuosa Gould, 1841, but not of Montagu, 1803; and *Thyasira hyalina*[2] Mörch,[3] 1857, are synonymous.

THYASIRA SARSII Philippi (as Axinus), 1845.

Greenland according to Posselt;[4] Norway, Spitsbergen, Iceland; Sars and others.

THYASIRA TRISINUATA d'Orbigny (as Lucina), 1846.

Labrador to Martinique, in 15 to 192 fathoms, North Atlantic, Vigo Bay, and Mediterranean, Jeffreys; also Sitka Harbor, Alaska, in 10 fathoms, and on the coast of Korea, by Captain St. John, R. N.

Axinus flexuosus var. *polygona* Jeffreys,[5] 1863, and *Cryptodon obesus* Verrill, 1872, are synonymous, and perhaps *Lucina flexuosa* of Beau's catalogue of the shells of Guadeloupe.

THYASIRA FUEGIENSIS Dall (as Cryptodon), 1889.

Magellan Strait, in 77 fathoms; also on the west coast of Patagonia, in 449 fathoms.

A large and feebly plicated species, recalling *T. sarsii* Philippi.[6]

THYASIRA PLANA Verrill and Bush (as Cryptodon), 1898.

Halifax, Nova Scotia, to Cape Cod, Massachusetts, in 8 to 100 fathoms.

Approaching the young of *T. sarsii*, but none of the size of adult *sarsii* have been obtained from the American coast south of Greenland.

THYASIRA INÆQUALIS Verrill and Bush (as Axinulus), 1898.

Halifax, Nova Scotia, to Cape Cod, Massachusetts, in 14 to 49 fathoms.

Distinctly plicate behind, and therefore not an *Axinulus*.

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[1] Seguenza, Vert. Plio. Ital., 1876, p. 9.

[2] Beck manuscript, 1847.

[3] In Rink's Greenland.

[4] Consp. Fauna Grönl., 1898, p. 80.

[5] Brit. Conch., II, p. 248.

[6] It is figured in Proc. U. S. Nat. Museum, XII, pl. XIV, fig. 2.

THYASIRA CONIA Dall and Simpson, 1901.

Off San Juan de Porto Rico, in 310 fathoms.

THYASIRA CROULINENSIS Jeffreys (as Clausina), 1847.

West Greenland, in 199 fathoms, Posselt; off Bermuda, in 435 fathoms, Challenger expedition; North Atlantic, Norway to the Azores, in 30 to 1,012 fathoms.

Axinus pusillus M. Sars (manuscript?) is said by G. O. Sars to be synonymous.

THYASIRA EQUALIS Verrill and Bush (as Cryptodon), 1898.

Nova Scotia to Chesapeake Bay, in 94 to 1,537 fathoms.

Cryptodon croulinensis var. *altus* Verrill and Bush, 1898, differs, according to the types, from this species by a longer and straighter anterior slope, but this character is shown by a large series to be inconstant. It occurs in the Gulf of Maine and south to Cape Cod, in 14 to 35 fathoms.

THYASIRA ROTUNDA Jeffreys (as Axinus), 1881.

Abyssal in the North Atlantic, and liable to be found in deep water on the American coast.

Axinus flexuosus var. *rotunda* Jeffreys.[1] This form is near to *T. equalis* Verrill and Bush, but is less truncate behind.

THYASIRA (AXINULUS) BREVIS Verrill and Bush, 1898.

Georges Banks, off Cape Cod, and south to the coast of North Carolina, in 100 to 1,825 fathoms.

Cryptodon obsoletus Verrill and Bush, 1898, is identical with this species, and the differences in the figures, especially as to the position of the ligament, are due to a misconception of the artist and the translucency of the very minute shell.

THYASIRA (AXINULUS) FERRUGINOSA Forbes (as Kellia), 1844.

Arctic seas, North Atlantic south to North Carolina on the west, and the Azores, Mediterranean, Adriatic, and the Morea on the east, in 20 to 1,525 fathoms; also in Bering Sea, Krause.

According to Jeffreys the *Kellia transversa* Forbes (1844, Aegean) and the *Axinus oblongus* Monterosato are the young of this species, which is relatively more transverse than the adult, and the same is probably true of the types of *Cryptodon* (*Axinulus*) *ovatus* Verrill and Bush, 1898, which in addition are abnormally modified by an excessive load of oxide of iron. Specimens purporting to be the same, from station 2113, U. S. Fish Commission, are apparently identical with *T.*

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[1] Proc. Zool. Soc. London, 1881, p. 701.

ferruginosa. The name of this species appears in the Moll. Marins du Roussillon, 1898, page 805, as *Axinus* "*ferrugineus*" Forbes.

THYASIRA (AXINULUS) CYCLADIA S. Wood (as Kellia), 1853.

Baffins Bay, in 1,750 fathoms, Valorous expedition; North Atlantic and Mediterranean, 3,038 fathoms.

Poromya subtrigona Jeffreys, 1858, is identical.

THYASIRA (AXINULUS) EUMYARIA M. Sars (as Axinus), 1870.

Baffins Bay, 1,100 fathoms, Valorous expedition; Norway and Mediterranean, in 200 to 1,456 fathoms.

THYASIRA (AXINULUS) SUCCISA Jeffreys (as Axinus), 1876.

Off Fernandina, Florida, in 294 fathoms; North Atlantic, 92 to 1,366 fathoms; Mediterranean, 40 to 120 fathoms.

This is perfectly distinct from *Axinus incrassatus* Jeffreys, 1876 (=*Leptaxinus* sp.) of which Jeffreys regarded it as a variety.

THYASIRA (AXINULUS) ELLIPTICA Verrill and Bush, 1898.

Off Marthas Vineyard, Massachusetts, in 1,451 fathoms.

This is *Axinodon ellipticus* Verrill and Bush, a species near *T. cycladia* S. Wood, but more rounded behind. The resilium is thicker and expanded behind on its ventral aspect, but is not internal in the strict sense of being occluded by the shell dorsally. A microscopic nodulation under the beaks does not seem to differ, except in being much smaller, from the occasional nodulations frequently found in typical *Thyasira* in the same region. Only one specimen is known, and the evidence seems quite insufficient to separate it from *Axinulus* as yet.

?THYASIRA (AXINULUS) SIMPLEX Verrill and Bush, 1898.

Casco Bay, Maine, to Marthas Vineyard, Massachusetts, in 349 fathoms.

This has the aspect of a nepionic shell and may even not belong to this family.

?THYASIRA (AXINULUS) PYGMÆA Verrill and Bush, 1898.

Halifax, Nova Scotia, to Marthas Vineyard, Massachusetts, in 206 to 499 fathoms.

Possibly the young of *ferruginosa.* At all events, it has the appearance of a nepionic shell and requires confirmation to rank as a species.

?THYASIRA (AXINULUS?) species indeterminate.

Off Bermuda, in 450 fathoms, Challenger expedition.

An undetermined species, reported by E. A. Smith in his report on the Challenger Pelecypoda, page 195, 1885.

AXINOPSIS ORBICULATUS G. O. Sars, 1878.

Greenland and Cumberland Sound, south to Casco Bay, Maine, 10 to 30 fathoms; Arctic Ocean and northern Norway, 8 to 120 fathoms, but not on the Pacific side.

A variety *inæqualis* Verrill and Bush, 1898, found in 18 to 26 fathoms from the Bay of Fundy to Cape Ann; is more quadrate, less orbicular, and all the specimens examined are smaller than the adult *A. orbiculatus*. A large proportion of all those dredged by the U. S. Fish Commission, when compared with those from the high north, appear to be immature. The forms referred to this species from the Pacific coast as far as examined all belong to other species of the genus.

AXINOPSIS CORDATA Verrill and Bush, 1898.

Marthas Vineyard to Cape Hatteras, North Carolina, in 43 to 202 fathoms.

Extremely close to those Thyasiras which have the proximal end of the indented anterior hinge line slightly thickened.

LEPTAXINUS MINUTUS Verrill and Bush, 1898.

Off Marthas Vineyard, in 100 fathoms; easily identified by the distinct lateral laminæ.

LEPTAXINUS INCRASSATUS Jeffreys (as Axinus), 1876.

Baffins Bay and North Atlantic, in 1,480 to 1,785 fathoms; north of Ireland, in 1,180 fathoms. A variety (?) off Culebra Island, West Indies, in 390 fathoms, Challenger expedition.

Jeffreys's original type is figured as exhibiting denticulations which probably belong to a provinculum. His specimens in the U. S. National Museum do not show it, but are evidently referable to *Leptaxinus*. His variety *succisa*, however, is a distinct species of *Axinulus*.

Note.—The shell described by Reeve in 1850 as *Lucina barbata* was doubtfully referred to *Cryptodon* by E. A. Smith, in his report on the Challenger bivalves. That gentleman now thinks this identification questionable, as it was founded on a single imperfect valve which may find a place in *Lucina*, properly so called. Both shells are probably true Lucinas and the Challenger valve may be a drifted young specimen of *L. philippiana* Reeve.

SPECIES OF THE PACIFIC COAST OF AMERICA.

THYASIRA BISECTA Conrad (as Venus), 1849.

Pl. 40, fig 8; pl. 42, fig 5.

Gulf of Alaska and Puget Sound, in 69 to 135 fathoms. Also in the later Tertiaries of California as far south as San Pedro.

This is *Cyprina bisecta* Conrad, 1865, and *Conchocele disjuncta* Gabb, 1866. It is the largest species of the genus, measuring up to 80 mm.

in extreme length, but shows absolutely no characters which might separate it from its smaller congeners. It was first described from the Miocene of Astoria; later turned up in the Pliocene of San Pedro (not the Post-Pliocene, as stated by Gabb) and lastly was dredged by the U. S. Fish Commission and the Young Naturalists' Society of Seattle, in Puget Sound.[1]

THYASIRA GOULDII Philippi (as Axinus), 1845.

Metchigme Bay, Bering Strait, south to Sitka Harbor, the Queen Charlotte Islands, and Puget Sound, in 8 to 111 fathoms. Also on the Atlantic coast and in the Pliocene of San Pedro, California, at Dead Mans Island; Arnold.

See the Atlantic list for further data.

THYASIRA TRISINUATA d'Orbigny (as Lucina), 1845.

Sitka Harbor, 10 fathoms; also on the Atlantic coast and the coast of Korea.

See the Atlantic list for further data.

THYASIRA BARBARENSIS Dall (as Cryptodon), 1889.

Coast of Washington, south to the Gulf of California, in 16 to 559 fathoms.

Recalling *T. sarsii*, but differently proportioned. The specimens named *Axinus flexuosus* by Cooper, from 120 fathoms, near Catalina Island, California, prove to belong to this species.[2]

THYASIRA EXCAVATA Dall, 1901. Pl. 39, figs. 2, 3.

Oregon to the Gulf of California in 66 to 1,005 fathoms.

A well-marked species notable for the sharp fluting of the posterior dorsal area. See notes and descriptions.

THYASIRA TOMEANA Dall, 1901.

Tomé, Chile, in 10 fathoms. See notes and descriptions.

THYASIRA MAGELLANICA Dall, 1901.

West coast of Patagonia in 194 to 348 fathoms. See notes and descriptions.

THYASIRA FUEGIENSIS Dall (as Cryptodon), 1889.

West coast of Patagonia and in Magellan Strait in 77 to 449 fathoms.

See the Atlantic list for other data.

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[1] It is figured in Proc. U. S. Nat. Museum, XVII, 1895, pl. XXVI, figs. 2 and 5.

[2] It is figured in Proc. U. S. Nat. Museum, XII, 1889, pl. VIII, fig. 9.

THYASIRA (AXINULUS) FERRUGINOSA Forbes (as Kellia), 1844.

Aleutian Islands in 60 fathoms; Krause.

See the Atlantic list for further data.

AXINOPSIS VIRIDIS Dall, 1901.

Plover Bay, Bering Strait, southward to Catalina Island, California, on the east, and to northern Japan (Capt. St. John, R. N.) on the west, in 5 to 167 fathoms.

A silky green, solid, orbicular species with very distinctly developed cardinal teeth. See notes and descriptions.

AXINOPSIS SERICATUS Carpenter (as Cryptodon), 1864.

Kyska Island, Aleutians, south to Puget Sound and Catalina Island, California, in 2 to 120 fathoms.

More ovate, flatter and thinner, with a less developed dentition and pale yellow periostracum. The name was misprinted *serricatus* in the British Association Report of 1863. See notes and descriptions.

Family DIPLODONTIDÆ Dall.

This family is composed of Lucinoid shells, in which the external limb of the gills is developed, reflected, and sometimes appendiculate, the adductor scars not projecting into the disks of the mantle, the hinge with the laterals obscure or absent, the valve margins plain, the shell suborbicular in outline, rarely nestling and irregular. The foot is elongated, cordlike, and more or less distally clavate in the typical forms, but may be nearly normal in the estuarine *Joannisiella*, affording a parallel to *Jagonia* in the *Lucinidæ*. Thoughout the family the dental formula is $\frac{\mathrm{L}\,0.1010.0}{\mathrm{R}\,0.0101.0}$, the central cardinals being usually bifid.

The fossil genus *Sphæriola* has much the appearance externally of *Diplodonta*, but the shell is heavy, and the hinge edentulous, and its relations to this family remain to be made out. The genus *Taras* Risso, from the figure and description,[1] would seem to be a *Diplodonta*, in which the delicate posterior cardinal of the left valve had been broken away and the corresponding tooth of the right valve mistaken for an adjacent lateral. It was founded on *T. antiquatus* Risso, a fossil of La Trinité (Tertiary). If this identification proves correct, the name *Taras* will supersede *Diplodonta*, being five years earlier in date. It was placed next to *Loripes* by Risso. I do not make the substitution, hoping that some Italian naturalist may be able to examine Risso's type species, and thus arrive at certainty before upsetting an old and familiar name.

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[1] Hist. Nat. Eur. Mér., IV, 1826, p. 344, pl. XII, fig. 167.

The family comprises the following genera:

DIPLODONTA Bronn, 1831.

Type, *Venus lupinus* Brocchi.

UNGULINA Daudin, 1802.

Type, *U. rubra* Roissy.

FELANIA Recluz, 1851.

Type, *Venus diaphana* Gmelin.

JOANNISIELLA Dall, 1895.

Type, *Cyrenella oblonga* Sowerby.

Of these genera only *Diplodonta* is represented in American waters, as far as yet known, and it is divisible into the following groups:

Section *Diplodonta* s. s. Type, *D. lupinus* Brocchi.

Section *Felaniella* Dall, 1899. Type, *Felania usta* Gould.

Shell like *Diplodonta*, but heavy, compressed, smooth externally, with a conspicuous usually dark periostracum and less equilateral valves.

This group exists well developed in the Eocene. The species called *Felania* by Carpenter, from American waters, are included in it. The type is from Japan.

Section *Phlyctiderma* Dall, 1899. Type, *Diplodonta semiaspera* Philippi.

Shell like Diplodonta, except that the surface, in addition to incremental sculpture, is punctate, pustulate or subreticulate. The type is from Cuba, but the group is world wide.

Section *Sphærella* Conrad, 1838. Type, *S. subvexa* Conrad= *Erycina subconvexa* d'Orbigny 1852, not *Lucina subvexa* Conrad, 1848.

Shell large, concentrically striate, an impressed line above the anterior cardinal, suggesting a minute lunule; the right posterior cardinal wide, undulated above, the posterior adductor scar distant from the hinge plate. The type is Miocene, and there is one recent species known from the Atlantic coast; *D. Verrilli* Dall, 1900.

Genus UNGULINA Daudin.

This is *Ungulina* Daudin,[1] sole example *U. rubra* Roissy[2] and *Clotho* Basterot, 1825, not Faujas St. Fond, 1808.

The type is *Tellina cuneata* Spengler,[3] but not of d'Orbigny, 1845. This specific name must be adopted in place of the more familiar *rubra* of Roissy. The *Ungulina transversa* of Lamarck,[4] is united by Deshayes with Lamarck's *U. oblonga*, and both are identical with

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[1] Bosc, Hist. Nat, Coq., III, 1802, p. 86.

[2] Idem, pl. xx, figs. 1, 2.

[3] Chemnitz, Conch. Cab. VI, 1782, p. 135, pl. XIII, fig. 131.

[4] Animaux sans Vertébres, V, 1818, p. 487.

U. rubra Roissy[1] and the earlier *cuneata* of Spengler. Conrad[2] reported the presence of this species in a mass of coral rock containing many West Indian boring mollusks, but this discovery has not been confirmed by any subsequent collector or explorer, though in itself not inherently improbable. In the absence of confirmatory evidence we can not regard the presence of *Ungulina cuneata* in the American or West Indian fauna as sufficiently established.

No species of *Felania* in the correct sense, or of *Joannisiella*, are known from the Western Hemisphere.

LIST OF EAST AMERICAN SPECIES.

DIPLODONTA TORELLI Jeffreys, 1876.

North Atlantic, southeast of Greenland, in 1,450 fathoms. Spitsbergen, in moderate depths of water. Also Aleutian Islands.

A rude, chalky species of large size, which may perhaps be found later on the Labrador coast. The figure of *Lucina leucophæata* Reeve, 1850, somewhat resembles this species.

DIPLODONTA PUNCTATA Say, 1822.

Cape Hatteras, North Carolina, to Rio de Janeiro, Brazil, in 14 to 124 fathoms, southward to the Straits of Magellan, and thence north to Chiloe Island.

This is *Amphidesma punctata* Say, 1822; *Lucina guaraniana* d'Orbigny, 1846; *Lucina venezuelensis* Dunker, 1848; *L. janeirensis* Reeve, 1850; *L. subglobosa* C. B. Adams (1847), 1852; *L. brasiliensis* Mittré, 1850 (but not *L. brasiliana* d'Orbigny, 1846, or *brasiliensis* Philippi, 1850); *Diplodonta Phillippii* Huppé, 1854, and *Mysia pellucida* Heilprin, 1889.

This is a plain, globose shell, with feeble incremental sculpture and microscopic radial striæ. The anterior end is somewhat attenuated and the posterior expanded. The young are often nearly orbicular. The specific name is derived from the punctation visible on the disk, internally in many specimens. It appears to pass through Magellan Strait and reach as far north as the island of Chiloe, on the Pacific side of South America.

DIPLODONTA NUCLEIFORMIS Wagner, 1838.

Cape Hatteras, North Carolina, to Porto Rico and St. Thomas, West Indies, in 15 to 52 fathoms.

This is *Mysia nucleiformis* of Wagner; *Loripes elevata* Conrad, 1845; *Cytherea sphærica* H. C. Lea, 1845; *Diplodonta elevata* Conrad, 1858, and *Mysia carolinensis* Conrad, 1875.

It is a small, suborbicular, globose species, which goes back to the Oligocene in time.

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[1] Sonnini's Buffon, Moll. VI, 1805, p. 575, pl. LXVI, fig. 4.

[2] Amer. Jour. Sci. XXIII, no. 2, 1833, p. 345.

DIPLODONTA PORTEZIANA d'Orbigny, 1846.

Rio de Janeiro, Brazil, and adjacent region. This is probably the same as *Lucina leucophæata* Reeve, 1850.

DIPLODONTA PATAGONICA d'Orbigny, 1842.

Near Rio de Janeiro, Brazil, in 59 fathoms, south to San Blas Bay.

DIPLODONTA (FELANIELLA) CANDEANA d'Orbigny, 1846.

Belize to Brazil, in 2 to 25 fathoms.

DIPLODONTA (FELANIELLA) VILARDIBOANA d'Orbigny, 1846.

Coast of Argentina, in 11 fathoms.

DIPLODONTA (PHLYCTIDERMA) SOROR C. B. Adams, 1852.

Texas coast to Jamaica. Pleistocene in South Carolina.

D. kiawahensis Holmes, 1858, is synonymous.

DIPLODONTA (PHLYCTIDERMA) NOTATA Dall and Simpson, 1901.

Marco, Florida, to Porto Rico.

Like *D. candeana*, but profusely punctate.

DIPLODONTA (PHLYCTIDERMA) SEMIASPERA Philippi, 1836.

Cape Hatteras, North Carolina, to Cape San Roque, Brazil, in 14 to 20 fathoms.

Lucina granulosa C. B. Adams, 1845, and Dunker, 1853; *L. semireticulata* (part) d'Orbigny, 1846, are synonymous.

DIPLODONTA (PHLYCTIDERMA) SEMIRETICULATA d'Orbigny, 1846.

San Sebastian, Brazil, and southward to the coast of Uruguay and Argentina in 11 fathoms.

D. semireflecta Krebs, 1864 (*lapsus*) and *D. platensis* Dall, 1899, are synonymous. D'Orbigny confused this and the last species under one name, though noting the differences (in 1853) between the Argentine and Antillean forms; but the figure given in the original publication is of the Argentine type, and I have therefore restored his name. The Antillean shell is more globular, smaller, and usually with the sculpture in separate granules or pustules, while that of the Argentine form is more like the reticulations of a stretched net.

DIPLODONTA (PHLYCTIDERMA) PUNCTURELLA Dall, 1899.

Jamaica, Porto Rico, St. Thomas, and receding to the Oligocene.

DIPLODONTA (SPHÆRELLA) VERRILLI Dall, 1899.

From Marthas Vineyard, Massachusetts, to North Carolina, in 15 to 69 fathoms.

This is *Diplodonta turgida* Verrill and Smith, 1881, not of Conrad, 1848.

LIST OF WEST AMERICAN SPECIES.

DIPLODONTA (TORELLI Jeffreys var.?) ALEUTICA Dall, 1901.

Southern part of Bering Sea, from the Pribilof Islands to the Aleutians, and eastward to the Shumagin Islands, in 3 to 13 fathoms.

A chalky, subrectangular species, with coarse epidermis. The young have a smooth surface and dark gray periostracum. The young of *Torelli* have a yellow periostracum, profusely wrinkled. The adults appear almost identical, though the regions occupied are on opposite sides of the world.

DIPLODONTA ORBELLA Gould, 1852.

Kadiak Island, Alaska, to the Gulf of California, in 5 to 30 fathoms.

Sphærella tumida (Conrad, Manuscript) Carpenter, 1863,[1] is synonymous. *D. subrugosa* Philippi[2] should be compared with it.

The gills in this species[3] are all developed, the foot with a short, stout stem, and distally subspherically bulbous; there are two entire siphonal orifices, without siphons, the anal exhibiting a short valve. It is the habit of the animal to form a sort of nest of sand and adventitious matter, cemented by mucus, with long tubular openings, the whole of irregular form, but completely concealing the inmate.

DIPLODONTA SUBQUADRATA Carpenter, 1855.

Catalina Island, California, south to Panama, in 16 to 36 fathoms.

More compressed and thinner than *D. orbella*, and of a different outline. In the description the edge of the excavated hinge plate has been mistaken for a lateral tooth. It is not *D. subquadrata* Gabb (=*D. gabbi* Dall), 1873, from the Tertiary of Santo Domingo, West Indies, but is probably referred to[4] by the name *D. undata* by Carpenter, 1857.

DIPLODONTA PUNCTATA Say, 1822.

From Magellan Straits northward to the island of Chiloë. See Atlantic list.

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[1] Not of Proc. Zool. Soc. London, 1856, p. 215.

[2] Zeitsch. Mal., 1848, p. 183.

[3] External and internal laminæ, direct and reflected, with an appendix.

[4] Mazatlan Catalogue, p. 103.

DIPLODONTA (FELANIELLA) OBLIQUA Philippi, 1846.

Cape St. Lucas to Guayaquil.

This is *Diplodonta obliqua* Philippi, 1846, but not *Lucina obliqua* Philippi, 1850 (April), nor of Reeve (June), 1850, Defrance, 1823, nor Goldfuss, 1841. *Lucina calculus* Reeve, 1850, is synonymous.

DIPLODONTA INCONSPICUA Philippi, 1842.

Island of Chiloe, on the southern coast of Chile.

This is *D. inconspicua* Philippi[1] and Huppé.[2] It is a rude species, with a coarse periostracum, the analogue in the Southern Hemisphere of *D. torelli* var. *aleutica* Dall in the northern Pacific.

DIPLODONTA (FELANIELLA) SERICATA Reeve, 1850

Lower California to Panama.

This species varies slightly in outline and convexity, according to its state of growth, and has been described in the Iconica under the names of *Lucina cornea*, *L. nitens*, and *L. sericata* Reeve. Carpenter called it *Felania serricata* (*sic*), by which name it is best known. He labeled some rather convex specimens in the U. S. National Museum *L. tellinoides* Reeve, but from the best information I can obtain the true *L. tellinoides* is a *Pseudomiltha*, as elsewhere indicated.

DIPLODONTA (PHLYCTIDERMA) CÆLATA Reeve, 1850.

Bay of Guayaquil, Cuming.

This species belongs to the same group as *D. semirugosa* Dall, but differs by its almost internal ligament, larger size, and coarser sculpture.

DIPLODONTA (PHLYCTIDERMA) SEMIRUGOSA Dall, 1899.

Gulf of California to Panama.

This is *Diplodonta semiaspera* of Carpenter, 1857, but not of Philippi, 1836, which is the West Indian form. The Japanese species which has been called by the same name is now known as *D. japonica* Pilsbry.

NOTES.

Lucina (*Diplodonta?*) *capax* Carpenter, 1863, page 69, from Panama, appears to be a *nomen nudum*. *Lucina obliqua* Philippi, 1850, is an uncertain species, both as to habitat and characters. It is not the *Diplodonta obliqua* Philippi, 1846. The *Lucina punctata* mentioned by Carpenter and others as inhabiting Panama is not the *Diplodonta punctata* Say or the *Codakia punctata* Linnæus. It was probably intended for the latter, which is not found on the west American coast, but is Polynesian. The references to west-coast localities are probably based on *Codakia colpoica* Dall. *L. punctata* of Poulsen's catalogue is probably *L. orbicularis* Linnæus. The *Diplodonta semiaspera* of Carpenter in the Mazatlan catalogue was a compound of several species. His variety *discrepans* is indeterminable. A pencil sketch of it in my possession, made by Carpenter, looks not unlike the young of *Diplodonta orbella* Gould.

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[1] Wiegmann's Archiv., 1842, p. 74.

[2] Gay's Chile, VIII, 1854, p. 357, atlas, pl. VIII, fig. 4.

Family LUCINIDÆ.

This family differs from the *Diplodontidæ* by its less perfectly developed gills; from the *Thyasiridæ* by the inclusion within the general mass of the body of the hepatic and sexual glands, and also by the gills being less developed; from the *Corbidæ* by the general shell characters and the loriform anterior adductor scars prolonged into the area of the disk. The branchial orifice is usually incomplete, and the anal is supplemented by a greatly developed introvertible tube, corresponding to the "valve" of an ordinary Teleodont siphon, and usually supposed to be, but actually not, homologous with a true siphon. If, as seems possible, the Silurian *Prolucina* is a true Lucinoid, this is one of the few families of Teleodonta which are represented in the Silurian, but the characteristics of *Prolucina* are not yet fully elucidated. Excluding pre-Tertiary groups, the family contains the following genera:

CODAKIA Scopoli, 1777.

LUCINA Lamarck, 1799.

LORIPES Cuvier, 1817.

MYRTÆA Turton, 1822.

PHACOIDES Blainville, 1825.

DIVARICELLA von Martens, 1880.

These groups and their subdivisions will be taken up serially.

Genus CODAKIA Scopoli.

This is *Codakia* Scopoli, 1777; *Orbiculus* (sp.) Megerle, 1811 (not *Orbicula* Lamarck, 1799); *Lentillaria* Schumacher, 1817; *Lenticularia* Gray, 1847; *Ctena* Mörch, 1860 (not *Ctenia* Lepel. et Serv., 1825, *Lepidoptera*); *Jagonia* Recluz, 1869; *Antilla* de Gregorio, 1885 (not *Antillia* Duncan, 1864, *Corallia*); *Codakia* Fischer, 1887, and *Lintellaria*, Bucquoy, Dollfus, and Dautzenberg, 1898 (*err. typ. pro Lentillaria*).

This is a well-marked genus which may be divided as follows:

Codakia s. s. Shell large and heavy with more or less distinctly reticulate sculpture, valves white externally, if colored the color is internal and chiefly marginal; with small beaks and lunule, not inflated, the ligament and resilium large, deeply inset, the former with an external calcareous coating; margins entire; foot moderately elongated but not loriform.

Dental formula: $\frac{\text{L lol. 1010. lol}}{\text{R olo. 0101. olo}}$. Type, *Chama codok* Adanson.

The posterior lateral teeth are obscured by the growth of the ligament in the adult, but traces of them can almost always be noted. The cardinals are not bifid and the anterior right cardinal is often obscured by the excavation of the lunule in front of it in the adult.

Jagonia Recluz. Shell smaller, lighter, frequently tumid and very inequilateral; beaks more prominent and the lunule, relatively, often larger; ligament and resilium external, on a narrow nymph, not coated with shelly matter; posterior laterals distinct; margins usually crenulate; foot differing little from the ordinary Pelecypod type. Type, *Le jagon* Adanson, = *Venus orbiculata* Montagu + *Lucina pecten* Lamarck.

In these forms the radial part of the sculpture is relatively more pronounced than in *Codakia*. The name *Ctena* of Mörch would have precedence over *Jagonia* if not regarded as preoccupied by the prior use of *Ctenia* in entomology.

In the typical division of the genus *C. punctata* and *C. tigerina* Linnæus (as *Venus*, 1758) are East Indian and Indo-Pacific, *C. orbicularis* Linnæus is Antillean, and a distinct species, here described, is found on the Pacific coast. These have been lumped together by most writers hitherto to the great confusion of the nomenclature; though, as Hanley pointed out half a century ago, Linnæus himself originally discriminated the three first mentioned and assigned the true localities to them; though he afterwards confounded the second and third. A similar confusion has, with more excuse, attended the names of the more common species of *Jagonia*.[1]

It is possible that when we know more about them some of the small species, here referred to, *Jagonia* may require a separate section for their reception, but for the present this seems unjustified. The East American species are as follows:

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[1] The Mediterranean species, long confounded with the *Lucina pecten* of Lamarck, is the *Tellina reticulata* of Poli, 1798, not of Linnæus, 1766; the *Lucina reticulata* of Payraudeau, 1826, not of Lamarck, 1818 (=*Semele* sp.); the *Lucina squamosa* and *pecten* of authors, but not of Lamarck; the *Lucina decussata* of Costa, 1830; and, according to Dautzenberg (Moll. de Roussillon) the *Lucina carnaria* and *mirabilis* of Locard, 1892. The latter is not the *L. mirabilis* of Dunker, 1865, which is *Miltha Voorhœvei* Deshayes, 1857, from Mozambique. The Mediterranean shell must then take the name of *Codakia* (*Jagonia*) *decussata* (Costa).

The common Indo-Pacific species has almost as complex synonymy, having been first described from specimens probably collected at the Sandwich Islands by Nuttall, but erroneously referred (like some other species of Nuttall) to San Diego, California, where no *Jagonia* exists. It is the *Lucina bella* Conrad, 1837, not of Carpenter, 1857; *L. fibula* (part) Reeve, 1850; *L. ramulosa* Gould, 1850; *L. divergens* of Philippi, 1850; and has been referred to *L. squamosa* and *L. pecten* of Lamarck by many authors. The name *Codakia* (*Jagonia*) *bella* (Conrad) must be retained for it.

CODAKIA ORBICULARIS Linnæus, 1758.✓

From St. Augustine, Florida, southward to the Keys; at Bermuda; also on the west coast of Florida north to Little Sarasota Bay; Texas; East Mexico; throughout the West Indies as far as Maceio, Brazil; (Senegal?). In 1 foot water, among algæ, Krebs.

This is the *Venus orbicularis* of Linnæus, 1758; *V. tigerina* (*part*), Linnæus, 1766; *Cytherea tigerina* Lamarck, *ex parte*, 1818, but not *C. tigrina* Lamarck, 1818; *Lucina tigerina* Reeve, 1850, not of Linnæus, 1758; *Lucina pusilla* Gould (nepionic shell), 1862; but not *Lucina orbicularis* Sowerby, 1837, nor Deshayes (Morea) 1836. *Venus incrustata* Linnæus, 1758, is supposed by Dillwyn to be based on an artificially polished specimen of this group.

CODAKIA CUBANA Dall, 1901.✓

Gulf of Mexico, at station 36, in 84 fathoms, U. S. Coast Survey steamer *Blake*.

A small, thin, and delicate species, with obsolete sculpture, as becomes its rather deep-water habitat. It was erroneously identified with *Lucina lenticula* Reeve, in the Blake Report of 1886.

CODAKIA (JAGONIA) ORBICULATA Montagu, 1808.

This species was first described by Montagu from an adventitious specimen supposed to be British. It is the *Venus orbiculata* Montagu, 1808, and Dillwyn, 1817; *Lucina squamosa* Lamarck, 1818, not of Lamarck, 1806; *Lucina pecten* Lamarck, 1818 (not of many authors); *Lucina imbricatula* C. B. Adams, 1845; *Lucina occidentalis* Reeve, 1850; *Lucina obliqua* Reeve, 1850 (according to E. A. Smith), but not of Defrance, 1823, or Philippi, 1850; *Lucina pectinata* C. B. Adams, 1852, not of Gmelin, 1792, or Carpenter, 1857; *L. nasuta* Guppy (erroneously as of Conrad), 1887; but not *Lucina orbiculata* Nyst, of the Belgian Tertiaries. Guppy's name is probably an error for *L. nassula* Conrad, which belongs in a totally distinct group.

This type appears to be very variable and to extend its range from Senegal and the Azores to the east coast of America and the Antilles. The following forms may be discriminated:

JAGONIA ORBICULATA var. ORBICULATA Montagu.

Cape Lookout, North Carolina, and Bermuda, south to the West Indies, the Abrolhos Islands and San Sebastian, Brazil; from low water to 52 fathoms: Senegal, Azores.

This is the common form in which the sculpture is of rather strong ribs radiating from the umbones and more or less divaricate toward the ventral margin, but not spinose or imbricate. It is *L. occidentalis* Reeve and *L. pectinata* C. B. Adams.

JAGONIA ORBICULATA var. FILIATA Dall, 1901.

Florida Keys, Bermuda, and southward to Cuba and Yucatan, in 85 to 300 fathoms.

This is the deep-water type with obsolete sculpture and entire, not divaricating, riblets radiating directly to the margin. Reeve's figure of *obliqua* fairly represents this form.

JAGONIA ORBICULATA var. IMBRICATULA C. B. Adams.

Jamaica, Santo Domingo, Santa Lucia, Curaçao.

This form has straight, strong ribs, not divaricating, and concentrically, evenly subimbricate.

JAGONIA ORBICULATA var. RECURVATA Dall, 1901.

Florida Keys to Cape San Antonio, in 8 to 300 fathoms.

This form is more plump and the dorsal radials are distally arcuately recurved, meeting the shell margin at right angles.

CODAKIA (JAGONIA) COSTATA d'Orbigny, 1846. ✓

Cape Lookout, North Carolina, southward to Rio de Janeiro, and San Sebastian, Brazil, in 13 to 85 fathoms.

This is *Lucina costata* d'Orbigny, 1846, but not of Tuomey and Holmes, 1856; *L. textilis* Philippi, April, 1850, but not of Guppy, 1896; *Lucina antillarum* Reeve, August, 1850; *Lucina ornata* C. B. Adams (Manuscript 1847), 1852, but not of Reeve, 1850, nor of Agassiz, 1845.

This species varies from suborbicular to very inequilateral, but is easily recognizable by its fasciculated riblets and wedge-like shape.

CODAKIA (JAGONIA) PORTORICANA Dall, 1901. ✓

Mayaguez Harbor and San Juan de Porto Rico, in 20 to 30 fathoms.

A small and inconspicuous species, which is provisionally located in this group.

CODAKIA (JAGONIA?) PECTINELLA C. B. Adams, 1852. ✓

Jamaica and southward to Point Malaspina, on the Argentine coast, where it was dredged in 51 fathoms.

This little species is quite distinct from any of the others and wants the right anterior cardinal tooth. The radial ribs are strong and crossed by slender, sparse threads, which become lamellose on either side of the beaks. It may eventually be shown to be better placed in one of the groups included in *Phacoides*.[1]

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[1] It is figured in the Porto Rico Report, pl. VI, fig. 9.

The West American species are as follows:

CODAKIA COLPOICA Dall, 1901.

Gulf of California.

This is *Lucina tigerina* Carpenter, but not of Linnæus; *L. punctata* of various authors, but not of Linnæus. The true *tigerina* Linnæus (*L. exasperata* Reeve) is Indo-Pacific, and so is *L. punctata*. Both of them have a sculpture very distinct from that of the Gulf species, and both have erroneously been reported from Panama, and the latter from the Galapagos by Wimmer.

CODAKIA (JAGONIA) MEXICANA Dall, 1901.

Gulf of California to Panama and Guacomayo.

This species is much like *C. orbiculata* Montagu, but has a quite different lunule. It is the *Lucina pectinata* Carpenter, 1857, but not of Gmelin, 1792, or C. B. Adams, 1847; *L. fibula* Reeve, *ex parte* (fig. 33 only), 1850; *L. bella* Carpenter, 1864, not of Conrad, 1837.

CODAKIA (JAGONIA) GALAPAGANA Dall, 1901.

Galapagos Islands, Chatham, Hood, and Indefatigable.

This form is easily distinguished from *C. mexicana*, which has entire ribs, by its coarser, somewhat annulated, and distally fasciculated radial ribs. It does not appear to pass south of the Galapagos Islands.

CODAKIA (JAGONIA) CHIQUITA Dall, 1901.

Off Lower California at station 2830, dredged by the U. S. Fish Commission in 66 fathoms, sand.

This is perhaps the smallest species of *Jagonia* in west American waters; with fine concentric and sparse obscure radial sculpture, and suborbicular outline.

NOTE.—A *Lucina distinguenda* is enumerated by Fischer from Panama,[1] but without any author's name, and I am unable to discover any description or other reference to it in the literature which would enable me to determine what shell was intended. It is true, Fischer refers to it as the Pacific analogue of *L. tigerina* Linnæus, but as both *tigerina* and *punctata* have been reported from Panama, it is possible that there are more than one species of large *Codakia* native to that locality; and the one referred to by Fischer may prove, if identified, distinct from the Gulf species which I have named *C. colpoica*.

Genus LUCINA (Bruguière) Lamarck.

This is *Lucina* Bruguière, 1797 (not 1792, as often stated), in part; *Lucina* Lamarck, 1799; *Anodontia* Link, 1807; and *Loripes* of many authors, but not of Cuvier, 1817, after Poli, 1791. Type, *Lucina edentula* Linnæus.

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[1] Manuel, p. 160, 1881.

Shell inflated, thin, concentrically striated, anterior and posterior dorsal areas obsolete; lunule deep and narrow, no visible escutcheon; ligament and resilium deeply inset but not occluded; margins entire, anterior adductor scar long, hinge wholly edentulous, shell usually large.

The following subgenus may be admitted:

Loripinus Monterosato, 1883. Type, *Lucina fragilis* Philippi (=*L. edentula* Brocchi, not Linnæus), Mediterranean.

Shell small, with the ligament obsolete and the resilium wholly internal; the anterior adductor scar short and wide, otherwise like *Lucina*.

The following are the American species:

LUCINA CHRYSOSTOMA (Meuschen) Philippi, 1847.

Bermuda, South Florida, the West Indies, and northern coast of South America, in moderate depths of water.

This is *Tellina crysostoma* Meuschen, 1787, and *Venus edentula* Chemnitz, 1784; *Anodontia alba* Link, 1807; *Lucina chrysostoma* of Philippi, 1847, and Mörch, 1853.

It is the *Lucina edentula* of Reeve, 1850, and many other writers, but Hanley has shown that the Linnæan *edentula* (1758) was probably that named by Reeve *L. ovum*, an oriental form described by Forskal under the specific name of *globosa* (1776), and with which, according to von Martens (1880), *L. pila* Reeve is synonymous.

LUCINA PHILIPPIANA Reeve, 1850.

Cape Hatteras, North Carolina; Bermuda, and southward through the West Indies; Japan?.

This is the *L. edentula* Philippi, 1847, not Linnæus, 1758, and the *L. schrammi* Crosse, 1876. It varies sufficiently in its outline and convexity to suggest, in the absence of a series, that the student is dealing with more than one species.

A young valve of this species in defective condition may be the shell identified by Smith in the Challenger bivalves from near Bermuda as *Lucina barbata* of Reeve, an identification Mr. Smith regards as doubtful.

LUCINA EDENTULOIDES Verrill, 1870.

Magdalena Bay, Lower California, and in the Gulf of California.

It is *Loripes edentuloides* Verrill, 1870, and possibly was the shell intended by Carpenter when he cited a *Lucina capax* from Panama, to which I have not been able to find any other reference in the literature. This species is very similar to the West Indian form, but differs by its more central umbones, while the very similar *Lucina bialata* Pilsbry, of Japan, carries the process of centralizing the beaks almost to completion.

LUCINA PHENAX Dall and Simpson, 1901.

Mayaguez and San Juan harbors, Porto Rico, in 5 to 30 fathoms.

Small, delicate, sparsely concentrically threaded, with grayish periostracum, translucent white shell, the aspect of *Loripinus*, but the external ligament of *Lucina*. This species is described in the report on Porto Rico mollusks, prepared for the U. S. Fish Commission.

Genus LORIPES Cuvier.

Shell suborbicular with feeble sculpture, a narrow elongate lunule, posterior dorsal area obscure or absent; ligament obsolete, resilium separated from it, deeply immersed, wholly internal; hinge with the posterior laterals and right anterior cardinal absent, the anterior laterals often obsolete; margins entire, anterior adductor scar long and narrow.

Type, *Amphidesma lucinalis* Lamarck = *Tellina lactea* of Poli and others, but not of Linnæus, *Lucina leucoma* Turton, *L. amphidesmoides* and *lacteoides* Deshayes, and *L. elata* Locard. Habitat, Mediterranean.

The genus is *Loripes* Cuvier, 1817, not Schweigger, 1820; *Thyatira* Gray, 1847, not of Hübner, 1816; *Ligula* Menke, 1830, not of Montagu, 1803; *Lucinida* d'Orbigny, 1846, and *Lucinidea* Barrois (in Zittel), 1887.

The American species are:

? LORIPES CLAUSUS Philippi, 1848.

Belize, British Honduras, Rev. W. A. Stanton.

This species is solid, compressed, sharply concentrically, and minutely radially, striated; with a small but very distinct anterior dorsal area, deep short lunule, and well-developed anterior lateral tooth.

Lucina sulcata Reeve, May, 1850, is externally very similar, from the figure, but Reeve gives no data as to the hinge characters. *L. clausus* is figured by Philippi, 1850. Only one dead valve was received from the collector.

LORIPES CRYPTELLUS d'Orbigny, 1846.

Pernambuco, Brazil.

This species has a large dorsal anterior area, the hinge has the laterals obsolete as in *L. lucinalis* Lamarck, and the surface concentrically striate. As figured by d'Orbigny, the valves are markedly unequal, but this may have been an individual abnormality. It is much more inflated than *L. clausus*.

This species is called *Lucina* and *Lucinida cryptella* by d'Orbigny in his text, but on the Plate LXXXIV of the atlas, where it is figured, the name is *Lucina brasiliana* d'Orbigny. It is not the *Lucina brasiliensis* of Philippi, 1848.

The name *Loripes* has been very generally applied to the large, globose edentulous shells which are properly known as typical *Lucina*, but these have not an internal resilium. *Loripes lens* of Verrill and Smith, 1880, and *L. compressa* Dall, 1881, should be placed in the genus *Myrtæa*, as they also are destitute of the internal resilium which is the chief characteristic of the genus *Loripes*.

Genus MYRTÆA Turton, 1822.

This is *Cyrachæa* Leach, 1852, and *Ortygia* (sp.) Brown, 1827. Type, *Venus spinifera* Montagu, 1803. Northern Europe.

Shell ovate or subrectangular, not inflated, the dorsal areas obsolete, sculpture chiefly concentric; lunule and escutcheon long and narrow; ligament and resilium deep-seated, but not internal, anterior adductor scar rather short; hinge with the right anterior cardinal normally absent and the left laterals frequently obsolete.

Two sections are discriminable:

Myrtæa s. s. Shell of moderate size, with purely concentric sculpture.

Eulopia Dall, 1901. Shell small, with radial vermicular sculpture between stronger concentric lamellæ. Type, *Lucina sagrinata* Dall, 1886.

This group appears in the Oligocene of Bowden, Jamaica.

The American species are as follows:

MYRTÆA LENS Verrill and Smith, 1880.

From Cape Cod, Massachusetts, south to the Antilles and Rio de Janeiro, Brazil, in 50 to 464 fathoms, bottom temperatures ranging from 41.5° to 46.5° F.

This is *Loripes lens* of Verrill and Smith, 1880, but not *Lucina lens* of Roemer (Nordd. Kreidegeb.), 1841, nor *Lucina lens* of H. C. Lea (Virginia miocene) 1845.

MYRTÆA COMPRESSA Dall, 1881.

Cuba and Sombrero, West Indies, in 72 to 424 fathoms.

This is *Loripes compressa* Dall, 1881, and may prove to be an extremely transverse and compressed variety of *M. lens* Verrill and Smith.

MYRTÆA PRISTIPHORA Dall and Simpson, 1901.

Porto Rico, Santa Lucia, Barbados, and Grenada, in 30 to 300 fathoms.

Described and figured in the Porto Rico report of the U. S. Fish Commission.

MYRTÆA (EULOPIA) SAGRINATA Dall, 1886.

Florida Keys and westward to Yucatan Strait, in 85 to 300 fathoms.

A peculiar small shell with which *Lucina fabula* Reeve is naturally associated. It was described as *Lucina sagrinata*.[1]

NOTE.—The type of this genus is the *Venus spinifera* Montagu, 1803; + *Myrtæa spinifera* Turton, 1822; *Lucina hiatelloides* (Basterot) Philippi, 1836; and *Lucina spinosa* Philippi, 1844.

No species of this genus are yet reported from the Pacific coast.

Genus PHACOIDES Blainville.

This is *Phacoides* Blainville, 1825; *Lucina* Lamarck, 1801 (but not Lamarck, 1799); *Triodonta* (sp.) Gray, 1851 (not of Schumacher, 1817); *Here* Gabb, 1866; *Linga* de Gregorio, 1885; *Cavilucina* and *Dentilucina* Fischer, 1887.

This comprises most of the species included by many authors in *Lucina*, in a broad sense, but not the original *Lucina* of Lamarck, which has very generally been called *Loripes* erroneously.

Owing to the very numerous modifications of characters shown in this group, it becomes necessary, for clearness, to divide it into a rather large number of subdivisions, both subgenera and sections.

Subgenus **Phacoides** Blainville, s. s. Type *Tellina pectinata* Gmelin (+ *Lucina jamaicensis* Lamarck).

Shell lentiform, with strong dorsal areas and chiefly concentric sculpture, the cardinal teeth obsolete in the adult, but the laterals well developed.

This is *Dentilucina* Fischer.

Subgenus **Here** Gabb. Type, *Lucina richthofeni* Gabb.

Shell solid, globose, with developed dorsal areas and conspicuous concentric sculpture, the lunule often deeply impressed and the right anterior cardinal effaced, the other teeth well developed.

This is *Lucina* Schumacher, 1817, not Lamarck, 1799, + *Linga* de Gregorio, 1885. It may be divided into sections, the typical group, as above, and:

Section *Pleurolucina* Dall, 1901. Type, *Lucina leucocyma* Dall, 1886.

Shell with a small number of large radial ribs in addition to the concentric sculpture.

Section *Cavilucina* Fischer, 1887. Type, *Lucina sulcata* Lamarck.

Shell small, compressed, concentrically striate, the areas and teeth often obsolete, the lunule small and often deep.

Subgenus **Luciniaca** Dall, 1901. Type, *Lucina nassula* Conrad.

Shell lentiform, white, with well-marked dorsal areas, the sculpture reticulate and muricate, the right anterior cardinal obsolete.

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[1] It is figured in the Proc. U. S. Nat. Mus., XII, 1889, p. 263, pl. XIV, fig. 11.

This is a well-marked group, belonging in the warmer seas and having a very elegant type of sculpture.

Subgenus **Miltha** H. and A. Adams. This is *Miltha* H. and A. Adams, 1857, and *Milthea* Meek, 1876. The type is *Lucina childreni* Gray, 1825, as *Tellina*.

This group is solid, compressed, concentrically striate, with a conspicuous periostracum, narrow impressed lunule, inconspicuous dorsal areas, deeply inset but not internal ligament and resilium and entire margins. It is divisible into two sections:

Miltha s. s. Hinge with two clean-cut cardinal teeth in each valve, the inner pair bifid, the laterals absent or obsolete.

Pseudomiltha Fischer, 1885. Type, *L. gigantea* Deshayes, Eocene of Paris.

Shell much like *Miltha*, but with the hinge teeth wholly obsolete.

This type goes back to the beginnings of the Tertiary and includes some of the largest lucinoid forms known; one, the *Lucina megameris* Dall, of the Jamaican Oligocene, reaches a length of some 10 inches.

Subgenus **Lucinoma** Dall, 1901. Type, *Lucina filosa* Stimpson.

Shell usually large, lentiform, white, with a conspicuous periostracum, concentrically lamellose or striated; the cardinal teeth developed, the inner pair usually bifid; the laterals obsolete or absent, the inner margins entire.

This is a well-marked group with extensive geographical and geological distribution, inhabiting preferably cold waters and frequently abyssal depths.

Subgenus **Callucina** Dall, 1901. Type, *Lucina radians* Conrad.

Shell Dosinoid, concentrically filose, sometimes with feeble radial sculpture; the dorsal areas obsolete; the lunule small, comprised chiefly in one valve and fitting into a recess in the opposite valve; hinge with one cardinal in each valve, the other teeth feeble or absent; inner margins crenulate.

The *L. concentrica* Reeve is also a member of this group, which comprises the typical section, as above; and

Section *Epilucina* Dall, 1901. Type, *Lucina Californica* Conrad.

Shell veneriform, convex, all the hinge teeth developed, inner margins entire; otherwise like *Callucina*.

Subgenus **Parvilucina** Dall, 1901.

Shell small, plump, often inequilateral; sculpture more or less reticulate but not muricate, teeth small, but all usually present.

Section *Parvilucina* s. s. Type, *Lucina tenuisculpta* Carpenter.

Dorsal areas obscure or obsolete, sculpture feeble.

Section *Bellucina* Dall, 1901. Type, *Parvilucina eucosmia* Dall, 1901 (=*Lucina pisum* Reeve, 1850, not Sowerby, 1837, nor d'Orbigny, 1841, nor Philippi, 1850).

Dorsal areas and sculpture strong.

? Subgenus **Prolucina** Dall, 1896. Type, *Lucina prisca*[1] Hisinger, Silurian.

Shell compressed, arcuate, almost rostrate, the anterior portion larger, the anterior adductor scars high, large, Lucinoid; the posterior narrow, elongate. Teeth unknown.

This group appears to be genuinely Lucinoid, though *Paracyclas* Hall, generally referred to the Lucinacea, should probably be excluded from it, having no really Lucinoid features.

EAST AMERICAN SPECIES.

PHACOIDES PECTINATUS Gmelin, 1792.

St. Augustine, Florida, to the West Indies and southward to Montevideo, Uruguay, in shallow water.

This is *Tellina pectinata* Gmelin, 1792, and Wood, 1815; *Tellina jamaicensis* Spengler, 1798; *Tellina scabra* (Chemnitz) Wood, 1815; *Lucina jamaicensis* Lamarck, 1818; *Lucina scabra* Gray, 1825; *Lucina* (*Phacoides*) *jamaicensis* Blainville, 1825; *Lucina funiculata* Reeve, 1850, but not *Lucina pectinata* C. B. Adams, 1852, nor Carpenter, 1857.

PHACOIDES (HERE) PENSYLVANICUS Linnæus, 1758.

Cape Hatteras, North Carolina, south to and throughout the West Indies and the continental shores adjacent, in shallow water, one-fourth to 6 fathoms.

This is *Venus pensylvanica* Linnæus, 1758; *Lucina pennsylvanica* Reeve, 1850; *Lucina grandinata* Reeve, 1850, and *Lucina speciosa* Reeve, 1850, but not *L. speciosa* Rogers, 1836.

This well-known species is a very beautiful object when its periostracum is perfect, but the differences in the latter upon which Reeve founded one of his species are not constant in individuals from the same locality. The oriental *Lucina virgo* Reeve, which Tryon unites with this species, appears to me to be distinct, but I have some suspicion that the *L. obliqua* Philippi, 1850 (April, not of Reeve, June, 1850), may have been founded on a young shell of this species.

PHACOIDES (HERE) ADANSONII d'Orbigny, 1839.

Senegal, Canaries; St. Thomas, and other localities in the Windward Islands of the West Indies.

This is the *Lucina columbella* of authors, but not of Lamarck, whose type is a fossil of the French Miocene. It seems rare in the West Indies. It is not the *Lucina adansonii* Reeve (1850) = *senegalensis* Reeve, in errata.

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[1] See Zittel, Textb. Pal. I, 1896, p. 408.

PHACOIDES (HERE) AURANTIUS Deshayes, 1830.

St. Thomas, Santa Cruz, Guadeloupe, the Virgin Islands, and other localities in the Lesser Antilles, in one-fourth to 1 fathom water, sandy bottom.

This species is distinguishable from *P. adansonii* by other characters than its salmon-colored margins. It is the *Lucina aurantia* of Deshayes and has also been reported from the Azores.

— PHACOIDES (HERE) SOMBRERENSIS Dall, 1886.

Northern part of the Gulf of Mexico south to Sombrero Island, West Indies, in 60 to 84 fathoms.

This resembles *P. adansonii* in miniature.[1]

— PHACOIDES (PLEUROLUCINA) LEUCOCYMA Dall, 1886.

Cape Hatteras, North Carolina, and south to Cuba, in 49 to 683 fathoms.

This is immediately recognizable by its few broad ribs and small white shell, which is figured with the preceding.[2]

.. PHACOIDES (CAVILUCINA) TRISULCATUS Conrad, 1841.

Cape Hatteras, North Carolina, south to Cabo San Roque, Brazil, in 10 to 20 fathoms.

Notable for its obliquity and its two or three strongly marked resting stages, from which the name is derived. The original *Lucina trisulcata* Conrad, is a miocene fossil. The recent shell usually called by this name is often very similar to the fossil, but there is a larger, flatter, less coarsely sculptured form in the West Indies which has much less emphatic resting stages, and, if not distinct, is at least a recognizable variety, which may be called *blandus*.[3] It is intermediate between the typical *P. trisulcatus* and the Pacific coast *P. lamprus*. It varies from white, through yellow, to orange color.

PHACOIDES (LUCINISCA) NASSULA Conrad, 1846.

Cape Hatteras, North Carolina, south to Cuba and west to Mobile Bay, in 7 to 200 fathoms.

This is *Lucina lintea* Conrad, 1866, and *Lucina nassula* Conrad, 1846. It is not the shell intended by Guppy, under the name of "*nasuta* Conrad," which is a *Jagonia*, but Conrad has not described any *Lucina nasuta*.

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[1] See Proc. U. S. Nat. Mus. XII, 1889, p. 263, pl. XIV, fig. 13.

[2] Idem, 1889, pl. XIV, figs. 6, 7.

[3] See Report on Porto Rico shells, p. 493, 1901, pl. VI, fig. 13.

PHACOIDES (LUCINISCA) MURICATUS Spengler, 1798.

Florida Keys and West Indies, with adjacent coast, in 6 to 12 fathoms. (Pacific coast??)

This is *Tellina muricata* Spengler, 1798; *T. imbricata* Chemnitz (1799?); *Lucina scabra* Lamarck, 1818, but not *Tellina* (=*Lucina*) *scabra* of Chemnitz and Dillwyn, 1817; and *Lucina scobinata* Recluz, 1852. It is very easily recognized by its spinose radial sculpture prevailing over the concentric portion, while in the preceding species the reticulation is nearly uniform and the spinosities not prominent.

PHACOIDES (PSEUDOMILTHA) FLORIDANUS Conrad, 1833.

West coast of Florida from Charlotte Harbor to Cedar Keys, and westward to Corpus Christi, Texas.

Surface with rather rude concentric growth stages and a pale papery periostracum; the shell usually flat and rather heavy. It was described as a *Lucina* and referred by Tryon (1872) to *Loripes*.

PHACOIDES (LUCINOMA) FILOSUS Stimpson, 1851.

Casco Bay, Maine, south to Cape Florida, in 16 to 528 fathoms.

This is the *Lucina radula* Gould, 1841, but not of Montagu, 1803; and the *L. contracta* De Kay, 1843, not of Say, 1824. It has been united, erroneously, with the *Phacoides borealis* Linnæus, by several authors. It is a cold-water shell, and is found in increasingly greater depths as it passes southward.

PHACOIDES (LUCINOMA) BLAKEANUS Bush, 1893.

Massachusetts Bay to Cape Fear, North Carolina, in 18 to 464 fathoms.

Very close to the preceding species, but more quadrate, more sparsely lamellose, and with a relatively shorter anterior adductor scar, and shallower sulcus for ligament and lunule.

?PHACOIDES (LUCINOMA) BOREALIS Linnæus, 1766.

Iceland. European seas. Northeast America?

This is the *Venus borealis* of Linnæus in 1766, but not of Gmelin, 1792; the *Venus spuria* of Gmelin, 1792; *Tellina radula* Montagu, 1803; *Lucina alba* Turton, 1822, and *Thiatira spuria* Gray, 1847. This species has been reported from the east and west coasts of America by Carpenter, Cooper, and others, but the nearest authentic record is Iceland, on the authority of Steenstrup. The others are doubtless due to confusion with related but not conspicuously similar species.

PHACOIDES (CALLUCINA) RADIANS Conrad, 1841.

Cape Lookout, North Carolina, and south to Florida, Bermuda, and Porto Rico, in 5 to 85 fathoms, living, dead valves in 287 fathoms.

This is *Lucina radians* Conrad, 1841, and *Lucina radiata* of Conrad in his Medial Tertiary, 1845, but not *Lucina radians* Deshayes (in Melleville) 1843, which is a *Felaniella.*

PHACOIDES (CALLUCINA) BERMUDENSIS Dall, 1901.

Bermuda, Hartt.

This appears to be *Lucina lenticula* Reeve, August, 1850, not of Gould, June, 1850. I have therefore substituted a new name for the preoccupied term. The specimens which agree very well with Reeve's figure[1] were found incrusted in the limy sand of the beach and no living ones have come to my notice. It is not the species catalogued by me in 1889 as *L. lenticula.*[2]

PHACOIDES (PARVILUCINA) CRENELLA Dall, 1901.

Cape Henry, Virginia, south to Cuba, in 2 to 124 fathoms.

This is *Lucina crenulata* Dall,[2] but not of Searles Wood, 1840–1853, or Conrad (1834), 1840.

PHACOIDES (?) LENTICULUS Gould, 1850.

Rio Janeiro (?) United States exploring expedition, under Wilkes.

This is *Lucina lenticula* Gould, 1850 (not of Reeve). A dubious species of which the type is lost, the locality uncertain, and which is erroneously called *Cyclas* on Gould's plate.

PHACOIDES (BELLUCINA) AMIANTUS Dall, 1901.

Cape Lookout, North Carolina, south to the West Indies and to San Sebastian, Brazil, in 2 to 640 fathoms, living.

This is the *Lucina costata,*[2] of Dall, 1889, but not of d'Orbigny, 1846, or of Tuomey and Holmes, 1856. A very elegant little species, the analogue of *Lucina cancellaris* Philippi, of the Pacific coast. Living specimens have been found on the reefs among the Florida Keys by Hemphill and also dredged in 640 fathoms, Yucatan Strait, by the U. S. Coast Survey Steamer *Blake*, a very remarkable bathymetrical range.

WEST AMERICAN SPECIES.

PHACOIDES (HERE) RICHTHOFENI Gabb, 1866.

Catalina Island to Gulf of California, in 16 to 66 fathoms.

The analogue of the Atlantic *P. adansonii* d'Orbigny, but with a more capacious lunule. This feature, however, differs considerably at different ages of the same individual, and the young show but little excavation. The young is *Lucina excavata* Carpenter, 1857, not of d'Orbigny, 1851, but not the *excavata* of most west coast collections.

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[1] Conch, Icon., XI, fig. 67.

[2] See Bull. U. S. Nat. Mus., No. 37, 1889, p. 50.

PHACOIDES (HERE) MAZATLANICUS Carpenter, 1857.

Mazatlan.

Carpenter's specimens are so small that it is difficult to be certain about them, but they appear to be a distinct species, allied to the Atlantic *P. sombrerensis*. They are distinguished from young *approximatus* by their dense concentric lamellation.

PHACOIDES (CAVILUCINA) LAMPRUS Dall, 1901.

Gulf of California.

This varies from white to orange color, is concentrically filose, and often has the teeth quite distinct. It is *Lucina excavata* of most of the Pacific coast collections, but not of Carpenter, 1857, or of d'Orbigny, 1851.

PHACOIDES (CAVILUCINA) LINGUALIS Carpenter, 1864.

? Monterey, California. Gulf of California to Acapulco, Mexico.

The Pacific analogue of the Atlantic *P. trisulcatus* Conrad. Valves were collected at Monterey by Gabb, but they were probably adventitious, as no other collector has found the species north of the Gulf.

PHACOIDES (CAVILUCINA) PROLONGATUS Carpenter, 1857.

Cape St. Lucas.

A miniature of the preceding, with exaggerated obliquity. It appears to be rare, and I have seen only worn valves.

—PHACOIDES (PLEUROLUCINA) UNDATUS Carpenter, 1865.

Gulf of California.

This is *Lucina undata* Carpenter, 1865, but not of Lamarck, 1818. Since Lamarck's species had been transferred to *Lucinopsis* (= *Mysia*) before the publication of Carpenter's name, the latter need not be rejected.

PHACOIDES (LUCINISCA) FENESTRATUS Hinds, 1844.

Lower California to Panama (and Tumbez, Peru?), in 10 to 30 fathoms.

The finest and largest species of the subgenus, in occasional individuals of which a dwarf anterior right cardinal is perceptible. A young valve, probably of this species, was referred to *Lucina muricata* by Carpenter in the Mazatlan Catalogue, but the latter is not known from the Pacific Coast. *Lucina ochracea* Reeve, 1850, should be compared with this species.

PHACOIDES (LUCINISCA) NUTTALLII Conrad, 1837.

Santa Barbara, California, to the Gulf of California, in 16 to 30 fathoms.

The Pacific analogue of *P. nassula* Conrad of the Gulf of Mexico, but a larger and finer shell. A variety, *centrifugus* Dall, has the concentric sculpture near the beaks sparser, more elevated and fringed with flat spinules, usually worn off; it was dredged in the Gulf in 26 fathoms. Owing to the manner in which the muricate species have been confused with one another, it is difficult to disentangle their distribution from the literature; but I have seen no authentic specimens of this species from south of the Gulf of California.

? ? PHACOIDES (LUCINISCA) MURICATA Spengler, 1798.

"Tumbez, Peru," Reeve; "? Mazatlan" Carpenter.

The synonymy of this species will be found in the east coast list. I have never seen an authentically west coast specimen of this shell. It is not found in any of the faunal publications on this coast except that of Carpenter, and there, only with doubt, is identified from a minute fragment, less than a tenth of an inch long. Reeve's localities are notoriously unreliable. I consider that the presence of this species on the Pacific coast is yet to be demonstrated, but do not feel justified in omitting all reference to it here.

PHACOIDES (MILTHA) CHILDRENI Gray, 1825.

Gulf of California, Cape St. Lucas, Mazatlan.

This large flat species is unmistakable; the locality, Brazil, given in the Conchologia Iconica, is erroneous. The type specimen was described as inequivalve, but the specimens I have seen appear to be entirely equivalve. It was first described as a *Tellina*.

PHACOIDES (PSEUDOMILTHA) TELLINOIDES Reeve, 1850.

Magdalena Bay, west coast of Lower California, south to Guayaquil, in 11 fathoms.

Very like the *M. floridana* Conrad, but more elegant, and with a bright yellow periostracum. It seems to have been at first confused by Carpenter with *Felaniella sericata*, owing to the fact that Reeve's figure is not very characteristic. It was described as a *Lucina*.

PHACOIDES (LUCINOMA) HEROICUS Dall, 1901.

Off West Mexico, in 1,005 fathoms, in latitude 27° 24′ N., Gulf of California.

One of the finest species of this interesting and characteristic group, much larger than *æquizonatus* Stearns, and with a rounder outline.

PHACOIDES (LUCINOMA) ANNULATUS Reeve, 1850.

Sitka, Alaska, and south to San Pedro, California, in 8 to 135 fathoms.

This is the *Lucina borealis* of Cooper, Carpenter, and Gabb, but not of Linnæus; *Lucina filosa* Dall, 1870, not Stimpson, 1851; *Lucina acutilineata* of Gabb and other Californian authors, but not of Conrad, 1849; *acutilirata* "Conrad" of Cooper, 1864, in Carpenter, meaning *acutilineata*. Reeve's figure of his *annulata*, doubtfully referred to California, so exactly represents a young specimen of this species which has bleached or lost its yellowish periostracum, that I have little hesitation in referring it to our shell.

PHACOIDES (LUCINOMA) ÆQUIZONATUS Stearns, 1890.

(Plate XLI, figs. 2, 3.)

Santa Barbara channel, in 276 fathoms; a very distinct subquadrate species.

PHACOIDES (LUCINOMA) LAMELLATUS E. A. Smith, 1881.

West coast of Patagonia, in 10 to 369 fathoms, also in St. Andrews Bay.

A well marked species from the southern extreme of South America, originally described as a *Diplodonta.*

PHACOIDES (EPILUCINA) CALIFORNICUS Conrad, 1837.

Crescent City, California, south to San Diego, in 3 to 15 fathoms; Acapulco?

This is the *Lucina californica* of Conrad, and the young were named *L. artemidis* by Carpenter in 1856. A species unique in its characters among recent shells, but with an analogue in the Tertiaries of the southeastern States.

PHACOIDES (PARVILUCINA) TENUISCULPTUS Carpenter, 1865.

Nunivak Island, Bering Sea, and southward to Catalina Island, California, in 8 to 135 fathoms.

A species of which the metropolis is in the cold waters of the northern coast.

PHACOIDES (PARVILUCINA) APPROXIMATUS Dall, 1901.

Catalina Island, California, and south to Panama, in 5 to 40 fathoms.

Closely related to the last species, but smaller, more delicate, without the anterior right cardinal tooth which is developed in the northern shell, and most abundant in the Gulf of California.

PHACOIDES (BELLUCINA) CANCELLARIS Philippi, 1846.

Cerros Island, west of Lower California, and south to the Gulf and to Panama, in 5 to 30 fathoms.

An elegantly sculptured species, with analogues on the Atlantic coast and in the China seas.

NOTES.—The *Lucina cristata* of Recluz (not of Smith, 1885), is a *Tellidora*, near *T. Burneti* Broderip and Sowerby, but found on the Atlantic coast. *Lucina pulchella* C. B. Adams, 1845, not Grzybowski, 1899, is a *Strigilla*. *Lucina corrugata* Deshayes, 1843, is credited by him to California, but really belongs to the Indo-Pacific fauna, and has been collected at Singapore. It is *Lucina philippinarum* Hanley, 1850. *Lucina sulcata* Reeve, 1850, which has some external similarity to *Loripes clausus* Philippi, is regarded by Mr. E. A. Smith as identical with *L. argentea* Reeve, from the Moluccas, and appears to have the characters of *Phacoides*. *Lucina caribæa* d'Orbigny, of Beau's catalogue of the shells of Guadeloupe, is apparently a *nomen nudum*, as I have not been able to find any description of it in the literature.

A *Lucina oerstedti* of Mörch is listed from the West Indies in the Poulsen catalogue, but it is probably a manuscript name, and no shell so labeled now appears in the Poulsen collection at Christiania, according to Dr. Collett.

Genus DIVARICELLA von Martens, 1880.

This is *Cyclas* of Mörch, 1853, not of Lamarck, 1799; *Egraca* (sp.) of Leach, 1852; *Lucinella* Monterosato, 1883; *Loripes* and *Lucina* (sp.) of various authors. Type, *D. angulifera* von Martens = *Lucina ornata* Reeve, 1850, not of C. B. Adams, 1852, Mauritius.

This genus is divisible as follows:

Section *Divaricella* s. s.

Valves suborbicular, convex, subequilateral, with inconspicuous beaks, no dorsal areas, two cardinal teeth in each valve, the laterals variable, the posterior distant, usually obsolete; the anterior feeble, adjacent; ligament and resilium set in a groove, but not internal, the excavated striæ forming an angle on a line radial from the beaks. Type, *D. ornata* Reeve.

Section *Pompholigina* Dall.

Valves extremely tumid, the umbones subspiral, the teeth cyclodont, anterior and posterior dorsal areas indicated. Type, *Lucina gibba* Gray, W. Africa.

Section *Bourdotia* Dall.

Valves very inequilateral, subquadrate, the anterior end produced, the anterior dorsal margin concavely arcuate; a single minute cardinal in each valve; laterals obsolete; the excavated external sulci arcuate, not angulate. Type, *Lucina Bourdoti* Cossmann, 1882, Parisian Eocene.

Subgenus **Lucinella** Monterosato, 1883.

Shell like *Divaricella*, but the ligament obsolete and the resilium wholly internal, as in *Semele*. Type, *Lucina commutata* Philippi, 1836, = *Tellina divaricata* Linnæus, 1758; Mediterranean and western Europe.

LIST OF THE AMERICAN SPECIES.

DIVARICELLA QUADRISULCATA d'Orbigny, 1846.

Nahant Beach, near Boston, Massachusetts, and southward to the West Indies, Rio de Janeiro and Santa Caterina, Brazil, in from 10 to 50 fathoms.

This is (from types) *Lucina strigilla* Stimpson, 1851, and *L. divaricata* of Gould, 1841, and other early writers. It is also the *Lucina americana* of C. B. Adams in 1852; the *Cyclas dentata* of Verrill, 1873, and the *Lucina commutata* Arango, 1878, not of Philippi, 1836. A variety *transversa* Dall, 1901, with the valves disproportionately elongate in the direction of the hinge line, has been dredged in 22 fathoms off Cape Lookout, North Carolina, by the U. S. Fish Commission.

This species is distinguishable from the next by its longer, small and narrow, somewhat sinuous lunule and fine crenulation of the interior margins. The adult has no denticulations of the outer margin due to the external sculpture.

DIVARICELLA DENTATA Wood, 1815.

Cape Hatteras, North Carolina, south to the West Indies (and, according to d'Orbigny, to Brazil), in 10 to 60 fathoms.

It is the *Lucina divaricata* of many of the early writers, but not of Linnæus; but not the *Lucina dentata* of Defrance, 1823; the *L. serrata* of d'Orbigny, 1846; the *L. chemnitzii* of Philippi, 1848, and the *L. pilula* C. B. Adams, 1852 (young shells), are synonymous.

It may be known by its very small, deep, cordate lunule at any age, and in the adult it differs from *D. quadrisulcata* by its greater size and the denticulation of the lateral and dorsal margins by the external sculpture. The large specimens have a tendency to obsolescence noticeable in the teeth, and the laterals are often quite imperceptible.

DIVARICELLA EBURNEA Reeve, 1850. = L. [illegible]

Cape St. Lucas, Lower California, and southward to Panama.

It is the *Lucina eburnea* of Reeve, 1850, but not of Deshayes, 1835. It may be distinguished from the Antillean *D. quadrisulcata* d'Orbigny by its shorter, wider, and cordate lunule, and by the well-developed lateral teeth, which are well marked and distinct at all ages. The sculpture is also usually more arcuate.

DIVARICELLA PERPARVULA Dall, 1901.

Cape St. Lucas, Lower California, south to Guacomayo.

This is the *Lucina pisum* of Philippi in April, 1850, but not of

Reeve (=*seminula* Gould, 1861, but not of Deshayes, 1858) in November, 1850; nor the *L. pisum* Sowerby, 1837, nor the *L. pisum* d'Orbigny of 1841.

It is a small, globular species, with rather sparse external sculpture, more tumid than the young of *D. eburnea*. The specific name has been used so many times for different species of *Lucina*, *senso lato*, that it seems best to substitute a new one to avoid confusion. It has been found, adventitiously, at Monterey, California, by Gabb, with other exotic species.

NOTE.—The *Lucina digitalis* Krebs, 1864, not Lamarck, 1818, appears to be the *Strigilla pisiformis* of Linnæus. The *Lucina pulchella* C. B. Adams (Proc. Boston Soc. Nat. Hist., II, p. 10, 1845, but not of Agassiz, 1845) was also founded on *Strigilla pisiformis*.

? Family CORBIDÆ.

Genus CORBIS Cuvier.

This comprises *Gafrarium* (sp.) Bolten, 1798; *Corbis* Cuvier, 1817; *Fimbria* Megerle, 1811, but not of Bohadsch (*Nudibranchiata*) 1761; *Idothea* Schumacher, 1817, but not of Fabricius (crustacea) 1793. The type and sole recent species is *Venus fimbriata* Linnæus, 1758, + *Fimbria magna* Megerle, 1811, + *Idothæa perforata* Schumacher, 1817. It is a native of the China seas, from which several varieties have been described.

The generic name of Bolten, meaning a waffle iron, in allusion to the cancellate external sculpture, was applied to an assembly comprising one species subsequently made the type of *Corbis;* five species subsequently included in *Circe* Schumacher; and one peculiar *Venus* (*V. reticulata* Linnæus) which will have to retain the name if it be retained at all. We arrive, by the method of elimination, at this result, which, fortunately, is more convenient than to throw out names so universally accepted as *Corbis* or *Circe*.

In the Yoldi Catalogue[1] Mörch lists this species from the Antilles. In the Mazatlan Catalogue Carpenter[2] describes a minute shell which he suspected to be the young of a species of this genus, but to which he prudently gave no specific name. Mörch's reference is certainly erroneous and no confirmation of Carpenter's suspicion has been received, though collections in the Gulf of California have continued to be made for nearly half a century. The genus is represented in our early Tertiaries, but does not appear to have survived into the Miocene. I see no reason for supposing that it forms a member of the recent fauna on either of our coasts.

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[1] Volume II, 1853, p. 33.

[2] 1857, p. 101.

Family CYRENELLIDÆ.

The shells of this group, with a Lucinoid animal and Diplodonta-like shell, exhibit a hinge structure which is wholly distinct from any other of the Lucinacea. They are of brackish or fresh water situs and confined, as far as known, to the borders of the subtropical Atlantic and the Tertiaries of the southern United States.

Genus CYRENOIDA Joannis.

This is *Cyrenoida* Joannis, June, 1835, *Cyrenella* Deshayes, Feb., 1836, and *Cyrenoides* Sowerby, 1842. Type, *C. dupontia* Joannis, Senegal.

Shell thin, inflated, suborbicular, with a brownish or yellowish periostracum, concentrically feebly striated; adductor scars subequal, elongate-ovate, the anterior projecting very little into the area within the pallial line, internal margins not crenulate; hinge with a long external ligament enfolding a smaller resilium; right valve with two, and left with one ⊏-shaped cardinal laminæ, the ventral one in the right valve shorter and more compressed, the "hooks" or shorter limbs of the laminæ tending to be sulcate or bifid. There are no laterals. The original type appears to have had a defective hinge, as the figure of this part of the shell given by Joannis is erroneous.

CYRENOIDA AMERICANA Morelet, 1851.

Cuba and Porto Rico, in the deltas of streams.

More transverse than the African species and with a more delicate hinge and less prominent umbones.[1]

CYRENOIDA FLORIDANA Dall, 1896.

Brunswick, Georgia, south to the Everglades of Forida, and in west Florida, north to Charlotte Harbor and vicinity, in brackish marshes.

Smaller and more delicate and less quadrate than the Porto Rico species.

A much larger species occurs in the Pliocene of the Caloosahatchie beds of Florida, and has been named (1896) *C. caloosaënsis* Dall. It reaches a length of 31 mm.

NOTES AND DESCRIPTIONS OF NEW SPECIES.

THYASIRA BISECTA (Conrad).

(Plate XL, fig. 8; plate XLII, fig. 5.)

Figures are of a recent specimen with a length of 50 mm., which was dredged southeast of Alaska Peninsula in 69 fathoms, mud, the bottom temperature being 44° F. The younger specimens dredged at the same time show no essential differences except of size. Another specimen from 135 fathoms in Puget Sound measures 74 mm. in extreme length and about 28 mm. in diameter. I have seen some fossil specimens which attained even larger dimensions. The shell recalls *Megaxinus rostratus* (Pecchioli) in almost every respect, but the distal ends of the nymphs do not project as strongly as in that species.

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[1] See Porto Rico Report, pl. vi, fig. 5.

THYASIRA CONIA Dall and Simpson.

(Plate XLII, fig. 2.)

As this came to hand too late to be figured in the Porto Rico report, I give a figure of the species here from the largest specimen obtained in the vicinity of San Juan Harbor, in 310 fathoms, by the U. S. Fish Commission.

THYASIRA EXCAVATA, new species.

(Plate XXXIX, figs. 12, 15.)

Shell subovate, thin, white, with a pale yellowish periostracum; sculpture of concentric incremental lines, and in each valve three sharp and two or three obscure radial ridges. Beaks small, subacute, not prominent, distinctly prosogyrate; lunule and escutcheon well developed, elongate, rather narrow, and emphatically excavated, bounded by a well-marked carina, which in the case of the escutcheon is high, thin, and sharp, separated from another less acute radial keel by a wide, deep sulcus; on the disk near the middle are two other radials, evident but obscure, and another a short distance behind the lunular carina. The surface occasionally shows a faint dusting of microscopic granulation, which is usually abraded. Valves moderately convex, the interior polished, the hinge edentulous, the nymphs slender and delicate, the ligament narrow and more or less visible externally, the margin of the valve indented by the external ridges. Lon. 20.0, lat. 17.5, diam. 15.0 mm.

Dredged by the U. S. Fish Commission in the Gulf of California, between San Marcos Island and Guaymas, in 1,005 fathoms; bottom temperature, 37°.6 F. Also off Tillamook, on the coast of Oregon, in 786 fathoms, mud; bottom temperature, 37°.3 F.

This species is markedly characterized by the deeply excavated and sharply bounded escutcheon and lunule, in which respect it is not closely approached by any other.

THYASIRA TOMEANA, new species.

(Plate XXXIX, fig. 3.)

Shell moderately convex, subovate, concentrically sculptured with incremental lines and covered by a pale straw-colored periostracum. Lunule small, ovate, lanceolate, moderately impressed; escutcheon long, very narrow, bordered externally by a sharply incised groove; behind this a rather shallow sulcus radiates from the beak, bounded behind by a rounded radial ridge; ligament thin, delicate, set in a narrow groove; margins reflecting the external sculpture, beaks narrow, prosogyrate, inconspicuous. Lon. 14.5, lat. 13.0, diam. 9 mm.

Several valves came up with mud on the anchor from a depth of ten fathoms in the roadstead of Tomé, Chile.

THYASIRA MAGELLANICA, new species.

(Plate XLII, fig. 6.)

Shell small, white, subovate, moderately convex, with rather high and prominent beaks; external surface sculptured with faint incremental lines and shallow, ill-defined radial sulci; lunule small, moderately impressed, but without any well-defined bounding ridges; escutcheon narrow, obscure; just in front of it a shallow sulcus radiates from the beaks to the basal posterior margin; hinge edentulous, ligament feeble. Alt. 4.7, lat. 3.5, diam. 3.0 mm.

A single valve was obtained on the west coast of Patagonia in 194 fathoms, mud, the bottom temperature being 52° F.

This species appears to differ from *T. fuegiensis* Dall by its more elevated form, smaller size, and especially by the position of the posterior radial sulcus, which, though feeble as in that species, is situated much closer to the posterior dorsal margin.

AXINOPSIS SERICATUS (Carpenter).

(Plate XL, fig. 2.)

I have figured a typical specimen of Carpenter's shell for comparison with the following form, and also because the former has never been figured. Both the West American species are more solid shells and have the cardinals much better developed than the *A. orbiculatus* Sars of the North Atlantic. The specimen figured is from Puget Sound, where it was dredged by Dr. Kennerly.

AXINOPSIS VIRIDIS, new species.

(Plate XL, fig. 1.)

Shell small, polished, suborbicular, when fresh covered with a glistening pale-green periostracum, some times exhibiting lighter and darker concentric zones; sculpture solely of fine concentric lines of growth; beaks low, inconspicuous; lunule slightly impressed, but without any bounding sulcus or ridge, small, sublanceolate; escutcheon hardly recognizable, very narrow, and inconspicuous. The part of the lunule belonging to the right valve is slightly larger than the other. The ligament is small and very delicate, but not wholly concealed. The subumbonal tooth of the right valve is prominent and strong, the inflected tooth-like process of the left valve is well developed. Margins of the valves smooth, interior polished, with some obscure radial striæ; muscular and pallial impressions normal. In the animal the hepatic glands project in an arborescent manner from each side of the comparatively insignificant bodymass, the gills are normal and rather small. Alt. of shell 6.0, lon. 6.2, diam. 3.3 mm. The specimen figured is from Iliuliuk, Alaska, in 19 fathoms, mud.

Ranges over the North Pacific region from Bering Strait to Northern Japan on the west and Catalina Island, California, on the south and east, in 5 to 167 fathoms, muddy or sandy bottom.

I have described this shell with some hesitation, as it may prove to be the normally rotund form of which *A. sericata* Carpenter is an oblique and ovate variety, but until this is shown it would seem as if the differences are worthy of systematic recognition. The Carpenterian type measures in alt. 4.5, lon. 4.0, and diam. 2.6 mm.; the beaks are higher and more recurved, the periostracum pale yellowish gray and papery.

DIPLODONTA (TORELLI Jeffreys, var.?) ALEUTICA, new species.

(Plate XLII, fig. 3.)

Shell large, coarse, chalky, with a papery dehiscent periostracum, usually with the exterior more or less eroded; form somewhat longer than high, tumid, equivalve and nearly equilateral, the anterior end of the shell less rotund than the posterior; surface in the adult with rather irregular and marked concentric lines of growth; ligament external, set in a groove, with well-marked nymphs; teeth normal, slender, and delicate, in the adult more or less defective; beaks low and inconspicuous, slightly nearer the anterior end; interior chalky, the margins entire, the posterior muscular impression larger than the anterior. The young are proportionally more elongate and less tumid, with a smooth silky olivaceous periostracum. Lon. of adult, 26.5, alt. 22.0, diam. 14.0 mm.; of young shell (figured), lon. 15, alt. 12, diam. 6 mm. The figured specimen is from 10 fathoms, sandy mud, in Kyska Harbor, Aleutians; the type from 8 fathoms in the same body of water.

The species ranges from the Pribilof Islands to the Aleutian chain and eastward to the Shumagin Islands. It has not been found in the dredgings north of the Pribilof group.

The adult shell looks remarkably like the *D. torelli* Jeffreys, of the North Atlantic and Spitsbergen seas. Owing to their usual state of erosion it is difficult to compare adults, but the young of *D. torelli* has a coarsely wrinkled, yellowish periostracum and a rougher surface than that of *aleutica*. The ranges of the two are separated by an immense distance, but, whether due to analogous environment or congenetic origin, the adult shells are nearly indistinguishable.

From *D. orbella* Gould this species is easily separable on account of the more rotund and inflated shell, the texture of the shell substance and the more adherent periostracum of the former.

CODAKIA COLPOICA, new species.

(Plate XLI, fig. 4.)

This shell resembles the *C. orbicularis* Linnæus, so much that it has long been confounded with it and the most appropriate description is comparative. The *C. colpoica* when compared with *C. orbicularis* of similar size is flatter, with the radical sulci more numerous and the interspatial ridges consequently more numerous, more slender, and more uniform. In *orbicularis* the posterior dorsal area is usually well marked by finer and different sculpture from that of the rest of the disk, and near the dorsal margin the sculpture is frequently subspinose or minutely prickly. In *colpoica* the sculpture of the dorsal part of the shell insensibly merges into that of the disk and if anything is rather smoother. There is also a slightly lurid tint in the exterior white of *colpoica*, while that of *orbicularis* is more purely immaculate and snowy. The most conspicuous character however is in the lunule. This in *colpoica* is rather long and narrow, in *orbicularis*, short, cordiform, and more deeply impressed. In both it is confined to the right valve. In *orbicularis* the hinge teeth are usually more prominent, stouter, and adjacent to each other than in the Gulf species.

The specimen figured is from the Gulf of California, and has a length of 76, a height of 68, and a diameter of 22 mm.

The species has not, so far, been identified from any locality south of Acapulco, though a species of which I have seen no specimens and which may be the same has been reported from Panama and the Galapagos Islands.

Once segregated, this species is unmistakable, but the *orbicularis*, being a very common and supposedly widely distributed shell, is often mixed with it in lots supposed to be wholly West American. West Indian shells are often imported in quantity to West Mexican ports for sale to tourists, and, unless authentically collected by a reliable person, the localities for shells obtained from dealers are always subject to a little doubt.

CODAKIA CUBANA, new species.

(Plate XLII, fig. 4.)

Shell small, thin, subcompressed, whitish, with an obvious pale olivaceous periostracum; surface with a small anterior and larger posterior dorsal area, distinguished by an absence of radial sculpture and the somewhat more prominent concentric lines of growth; the rest of the disk with feeble, nearly uniform radial threads, separated by shallow radial sulci; beaks nearly central, small, recurved; lunule small, narrow, impressed, confined to one valve, usually the right; escutcheon absent, ligament normal but feeble; teeth normal but small and delicate, the laterals tending to obsolescence; adductor and pallial scars normal, the interpallial space with a strong oblique sulcus; interior of the disk more or less radially striate; margins crenulate below. Alt. 17.5, lon. 19.0, diam. 7.5 mm.

Dredged off the coast of Cuba in the Gulf of Mexico, in 84 fathoms.

CODAKIA (JAGONIA) PORTORICANA, new species.

(Plate XXXIX, fig. 6.)

Shell small, plump, oblique, inequilateral, white or yellowish; anterior end larger, produced downward and forward; posterior end shorter and smaller; surface sculptured with numerous radial sulci, separated by wider flattish interspaces crossed by rather regular, moderately separated, concentric elevated threads, the radials obsolete on the inconspicuous dorsal areas; lunule elongated, moderately impressed, escutcheon short, narrow, inconspicuous; beaks high, rather small, apically smooth and polished, prosogyrate; hinge normal, delicate, the laterals in the right valve well developed; ligament feeble, short; interior more or less striate, radially; basal margin finely crenulate. Alt. 6.7, lon. 7.5, diam. 6.0 mm.

The figured specimen, the largest valve obtained, is from San Juan Harbor; smaller ones were dredged in the harbor of Mayaguez.

This inconspicuous little species appears to be rare, and comes nearest to *Jagonia costata* d'Orbigny, than which it is more finely and evenly sculptured, beside being a more tumid and smaller shell. In preparing the Porto Rico report this species was overlooked.

CODAKIA (JAGONIA) MEXICANA, new name.

(Plate XL, fig. 6.)

One of Reeve's figures in the Iconica (fig. 33) appears to represent this species, which is very similar to the West Indian *C. orbiculata* Montagu. I find, however, on careful examination that in the west coast shell the lunule is narrower, longer, and less deeply impressed than in *C. orbiculata*, the shell is more delicate, thinner, and more flattened toward the lower margins, the sculpture is more regular and the concentric threads less crowded, so that while the difference is not great the effect in *C. mexicana* is much more elegant; toward the ends it has the radials stouter and with wider interspaces, and with the sculpture on the dorsal areas less distinct from that on the disk than it is in the West Indian form. It is most commonly labeled *Lucina bella* Conrad, in collections, and by Carpenter was named *L. pectinata*, though it is not the *pectinata* of Gmelin or C. B. Adams. A full-grown specimen measures: alt. 21, lon. 23, diam. 10.0 mm.

CODAKIA (JAGONIA) GALAPAGANA, new species.

(Plate XL, fig. 4.)

Shell of moderate size, moderately convex, white or with a yellowish flush, most conspicuous in the interior and frequently with a ferruginous tinge about the posterior dorsal area. It much resembles *C. orbiculata* Montagu, of the West Indies, but its most conspicuous feature is its somewhat loose and irregular radial sculpture in which the ribs are bifurcate or trifurcate distally, somewhat as in *C. costata* d'Orbigny. The lunule is nearly evenly divided between the valves, the dorsal areas inconspicuous, and the radials on the posterior area have a tendency to become minutely nodulous. The figured specimen is from Indefatigable Island, and measures: alt. 19, lon. 19.5; diam. 9.0 mm. Another has the alt. 21, lon. 23 and diam. 9 mm. It appears to be common on the shores of the Galapagos Islands, but has not been found on the American coast or elsewhere as far as known.

CODAKIA (JAGONIA) CHIQUITA, new species.

(Plate XXXIX, fig. 1.)

Shell small, suborbicular, flattish, of a yellowish white color, with the beaks small, rather elevated and erect but not tumid; sculpture of regular, sublamellose, concentric, rather crowded threads, under which are numerous fine, often nearly obsolete, radial threads frequently bifurcate distally, less prominent on the middle of the disk and absent from the dorsal areas; lunule well impressed, subequally divided between the valves, short and sublanceolate; hinge and ligament delicate, normal, with no visible escutcheon, lateral teeth feeble; interior polished, the margins minutely crenulate. Alt. 9.7, lon. 10.0, diam. 4.5 mm.

This has only been found at one locality on the west side of the lower end of the peninsula of Lower California, nearly abreast of La Paz, in 66 fathoms.

LUCINA PHENAX Dall and Simpson.

(Plate XL, fig. 3.)

This pretty little species was discovered too late to be figured in the Porto Rico report, and I have therefore inserted the illustration of it here. It is of a white color and delicate texture, quite tumid, and so much resembles a *Loripinus* that it would be immediately taken for one, but a careful inspection of the hinge shows that the ligament is external and the hinge that of a typical *Lucina*. The specimen figured is from San Juan Harbor in 5 fathoms and measures: Alt. 8.8, lon. 10, diam. 3.5 mm.

LORIPES CLAUSUS Philippi.

I have some doubt as to the original habitat of this species, as a vessel having West African ballast seems to have been wrecked at Belize, and the Rev. W. A. Stanton collected several dead shells which appear to have come from this ballast, and it is possible this should be included among them. It was originally described with no habitat.

PHACOIDES (LUCINOMA) FILOSUS Stimpson.

(Plate XL, fig. 11.)

The general confusion which has reigned for some time in regard to the Lucinoids of the group typified by this species, and of which *Lucina borealis* Linnæus is a peripheral form, has led to a number of misidentifications by the writer, as well as by Cooper, Carpenter, and others, in the past. The Pacific coast form is so near to *filosus* that when it was not identified with *L. borealis* or the Miocene *multilineatus* the name given by Stimpson to the New England form was almost always applied to it. Though there is quite a range of variation in these species, they can invariably be separated by the characters of the deep, narrow sulcus in which the ligament lies. In *P. filosus* the sides of this sulcus rise perpendicularly on each side of the ligament, forming a high keel, and the sides of the lunule show this in a less, but still a noticeable, degree. In *P. annulatus*, on the other hand, the top of the ligament is as high or higher than the sides of the sulcus in which it lies, and the lunule is similarly shallow. The posterior dorsal margin in *filosus* is generally more arcuate, but this is not an invariable character. In order to illustrate the comparison, figures are given of the interior of a valve of each. In the figure given in Proc. U. S. Nat. Mus., XIII, 1890, pl. XVII, fig. 5, by an error of the draughtsman the anterior adductor scar is incorrectly represented as short. The correct proportion is shown in our present figure.

PHACOIDES (LUCINOMA) ANNULATUS Reeve.

(Plate XL, fig. 10.)

See remarks under the preceding species. The present figure is from a specimen collected at Clayoquot, Vancouver Island, measuring alt. 50, lon. 58, and diameter 19 mm. It is a curious fact that the Miocene *P. contractus* Say more closely resembles the Pacific coast recent shell than it does the living species of the adjacent Atlantic coast.

PHACOIDES (CALLUCINA) RADIANS Conrad.

(Plate XLII, fig. 8.)

Conrad's figure of this species[1] is very poor, and the identification depends upon his specimens rather than his illustration. The same specific name had been chosen by Deshayes for a species of *Diplodonta*, but as these belong in different families and were long since separated, it does not seem as if the specific name need be changed, as was done by d'Orbigny, who called the French fossil *subradians*.

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[1] Fossils of the Medial Tertiary, 1845, pl. XL.

A better figure than Conrad's was given by Tuomey and Holmes, but this being accessible to few students, I have refigured the species from a recent specimen, 20 mm. in height, collected at Pensacola, Florida.

PHACOIDES (CALLUCINA) BERMUDENSIS, new species.

(Plate XXXIX, fig. 5.)

Reeve's figure of *lenticula* in the Iconica fairly well represents this species, though I can not be certain that the shells are identical, since Reeve gives no data in regard to the hinge or interior. His name at any rate is preoccupied, and it is probably best to treat our specimens as new.

Shell small, discoid, suborbicular, white or brownish, equilateral; beaks small and low but acute; lunule long and narrow, moderately impressed; escutcheon and dorsal areas absent or obsolete; sculpture of close, fine, sharp, concentric lamellæ with slightly wider concentrically striated interspaces; there is no radial sculpture; hinge strong, muscular impressions normal, groove for the ligament long, shallow; margins of the shell without crenulation. Alt. 16.5, lon. 17.0, diam. 7.0 mm.

This species somewhat resembles *P. radians*, but is entirely destitute of any radial sculpture, and has a proportionately longer and narrower lunule, less deeply impressed.

PHACOIDES (PARVILUCINA) CRENELLA, new species.

(Plate XXXIX, fig 2.)

The small shells of this type from the Oligocene to the living fauna have been called by the name of "*Lucina crenulata* Conrad," without exception, and their differences ascribed to "variability." Careful study shows in this, as in other cases, that several distinct species should be recognized. The original locality of Conrad's shell is the Miocene of Suffolk, Virginia, where it is found abundantly. With this as a standard the others have been compared. The living shell hitherto confounded with it is represented in the fossil state in the Pleistocene of North Creek, Florida, and Simmons Bluff, South Carolina, the Pliocene of North and South Carolina, and of the Caloosahatchie beds, Florida. It does not appear in the Miocene. In the present fauna it has a wide range. It differs from the true *crenulatus* as follows: It is thinner, more delicate, with a less heavy hinge, more tumid valves, and is generally more equilateral and the beaks more central. *P. crenulatus* has prominent, almost lamellose concentric sculpture, which is frankly lamellar on the ridges of the posterior dorsal area, which are separated by a more marked radial sulcus and have the whole area relatively wider than in *P. crenella;* in the interspaces only is the radial sculpture of *P. crenulatus* visible and it is composed of close-set threads usually uniform and rather strong; *P. crenella* has the concentric sculpture of low, very fine threads or sulci which do not conceal any part of the radial sculpture, which is feebler, less compact, and more inconstant than in the Miocene shell, being frequently almost entirely obsolete. The lunule in the two species is similar, being larger and less impressed in the left than in the right valve. The crenulation of the inner margin of the valves is stronger, closer, and more prominent in the Miocene shell, in harmony with the stronger radial sculpture.

The specimen figured is from Palma Sola, Florida, and measures 6.5 mm. in height, 6.7 in length, and 4.5 in diameter. The *Lucina crenulata* of Searles Wood in the Crag monograph is a species belonging to the same group, but apparently distinct from either of the American forms.

PHACOIDES (PLEUROLUCINA) UNDATUS Carpenter.

(Plate XXXIX, fig. 14.)

A figure of this elegant and hitherto unfigured species is now furnished. The specimen shown is from the Gulf of California, and measures 10 mm. in height. A larger size is common, but our freshest and best specimens are mostly only adolescent.

PHACOIDES (BELLUCINA) AMIANTUS, new species.

(Plate XXXIX, fig. 10.)

This is another case in which allied species have been indiscriminately lumped. Fortunately the name *costata*, which has been generally used for it, is unavailable, leaving us free to name the component species without regard to the original type of Tuomey and Holmes, which is different from that of Holmes in his Pleistocene volume, both being very inadequately figured. Similar species occur from the Oligocene to recent seas and on both east and west coasts of America.

Shell small, solid, white, usually subequilateral with strong sculpture and hinge; beaks variable, usually rather conspicuous; sculpture of about twelve strong, flattish, radial ribs, separated by deep, narrower, channeled interspaces, less distinct basally in senile specimens; the ribs are crossed by numerous adjacent, flat, strap-like threads, which in well-developed specimens seem to bridge the interspaces; dorsal areas large and conspicuous; anterior with two broad wave-like radials, sometimes slightly lamellose; posterior with one slender radial, which, with the boundary rib in front of the area, is conspicuously nodular; lunule small, deeply impressed, ill defined; hinge and muscular impressions normal, strong; inner margins finely crenulate. Alt. 7.6, lat. 8.3, diam. 6 mm. Most specimens are one-third smaller. The varieties are chiefly in asymmetry, some specimens having the beaks very posterior, especially in the young; the radial ribs are sometimes bifurcate distally, and the concentric sculpture varies in strength and condensation. The *P. cancellaris* Philippi is the Pacific coast analogue.

PHACOIDES (HERE) RICHTHOFENI Gabb.

(Plate XL, figs. 7, 9.)

Views of a young specimen from 15 fathoms, gravel, on the north side of Catalina Island, California, are given. The adults have a much more cavernous lunule. The figured specimen measures: alt. 13.0, lat. 14.5, diam. 7.5 mm.

PHACOIDES (CAVILUCINA) LAMPRUS, new species.

(Plate XXXIX, fig. 9.)

Shell of Dosinioid form, solid, nearly orbicular, slightly convex, suffused with yellow or pink, strongest on the interior of the shell, or plain white; beaks subcentral small, prosogyrate, with a small, more or less excavated lunule usually almost confined to the right valve; sculpture chiefly of fine, low, rather sharp, concentric threads with occasional sulci, due to resting stages, near the margin in senile specimens; radial sculpture comprising more or less microscopic striulations and a broad shallow flexuosity of the posterior dorsal area, which is often obsolete; dorsal areas inconspicuous; hinge and muscular impressions normal, basal margins very minutely crenulate. Alt. 23.5, lat. 23.5, diam. 10.5 mm.

The figured specimen is from La Paz, Lower California. This species has long been known in Pacific coast collections as *Lucina excavata* Carpenter, a name preoccupied in the genus, but a camera lucida drawing of his type of *excavata* by Carpenter shows that his type specimen was a young valve of *Here richthofeni*, afterwards described from fossil specimens by Gabb. The amount of excavation of the lunule in *P. lamprus* varies in individuals, and between the two valves. It seems to be relatively greater in the young, contrary to the rule in *richthofeni*. The solidity and thickness of the shell are notable.

PHACOIDES (CAVILUCINA) LINGUALIS Carpenter.

(Plate XXXIX, fig. 7.)

This species, I believe, though abundant in the Gulf of California, has never been figured. Therefore I thought it useful to illustrate it. It is the west coast analogue of *P. trisulcatus* Conrad. *Phacoides* (*C.*) *prolongatus* Carpenter appears to be distinct, from the specimens I have seen, all of which are poor. It is smaller, higher in proportion, and with more prominent beaks.

PHACOIDES (LUCINISCA) NUTTALLII var. CENTRIFUGUS Dall.

(Plate XXXIX, fig. 13.)

P. nuttallii is one of the most attractive of the West American species. Its elegant reticulate sculpture is usually very evenly distributed. Some specimens from the Gulf of California, however, have the concentric sculpture near the beaks more elevated and the lamellæ more widely separated, while the radial sculpture remains unchanged, thus altering the appearance of the shell very materially, especially in rather young specimens. The concentric ridges at the intersections give out little flat unciform scales or spines, extremely caducous and always lost in the adult. The general aspect of this variety is so striking that I have thought it would be useful to name and illustrate it.

The figured specimen is from 26 fathoms, sandy mud, in the Gulf of California and measures 7 mm. in length.

PHACOIDES (LUCINOMA) HEROICUS, new species.

(Plate XLI, fig. 1.)

Shell large, moderately convex, chalky white, with a strong olivaceous periostracum; beaks small, pointed, recurved, not much elevated; dorsal areas indicated by a more emphatic flexuosity than is usual in this group; sculpture of concentric, fine wrinkles and distant, concentric, sharp, elevated lamellæ, continuous over the whole shell: ligament long, strong, in a very shallow groove; lunule long, narrow, rather deeply impressed, its periostracum darker than on other parts of the shell; teeth slender, normal, a feeble anterior left lateral is visible; muscular impressions normal, margins not crenulated. Alt. 65, lon. 71, diam. 27 mm.

This very fine abyssal shell is nearest to the *P. æquizonatus* Stearns (Plate XLI, figs. 2, 3), which is much smaller and more quadrate.

PHACOIDES (PARVILUCINA) TENUISCULPTUS Carpenter.

(Plate XL, fig. 5.)

This unfigured species is now illustrated from a specimen from the typical locality, Puget Sound, which has an altitude of 12 mm.

This is one of the most abundant shells in Alaskan dredgings from over a muddy bottom, usually in 10 to 20 fathoms. Its chalky shell is almost invariably more or less abraded.

PHACOIDES (PARVILUCINA) APPROXIMATUS, new species.

(Plate XXXIX, fig. 4.)

Shell small, tumid, nearly equilateral, white with a yellowish periostracum; beaks high, full, with a rather emphatically depressed lanceolate lunule; sculpture of numerous fine, rounded, usually entire riblets separated by narrow sulci on the disk, but absent from the dorsal areas; concentric sculpture of low, feeble, distant, elevated lines which become feebly lamellose on the dorsal areas; hinge, especially the laterals, strong, normal; muscular scars as usual; basal margin conspicuously crenulate. Alt. 6.5, lon. 6.3, diam. 4.0 mm.

The specimen figured is from the Gulf of California, in 26 fathoms, sand.

In the region south and east of Lower California this species, which is the Pacific analogue of *P. crenella* Dall, is very uniform, but toward the northern extreme of its range the radial riblets on the middle of the disk tend to become obsolete, and then the concentric sculpture is more prominent. This variety does not change its size and never reaches more than one-third the size of the northern *tenuisculptus*, which had doubtless the same genetic origin, judging from the material I have examined. Very conservative persons might prefer to regard the two as extremes of one polymorphic species, but so far I have not found a series which would completely unite them by gentle gradations.

PHACOIDES (BELLUCINA) CANCELLARIS Philipp

(Plate XXXIX, fig. 11.)

This very elegant but hitherto unfigured little shell is now illustrated. It is the Pacific analogue of *P. amiantus* Dall of the Atlantic coast. The specimen figured is from the Pacific coast of Lower California near the southern end of the peninsula, in 26 fathoms, sand, and measures 5.3 mm. in length. It is a shorter shell with fewer ribs than *P. amiantus*, and the nodules on the radials of the posterior dorsal area are longer and more conspicuous.

DIVARICELLA PERPARVULA, new name.

(Plate XXXIX, fig. 8.)

This species being unfigured an illustration of it was thought desirable. The specimen figured is from Acapulco and measures 7 mm. in length.

CYRENOIDA FLORIDANA Dall.

(Plate XLII, fig. 7.)

This species, hitherto unfigured, is now illustrated. The specimen shown is from a salt pond at Boca Ciega Bay, Florida, and measures 14 mm. in length. The average specimens, however, are fully one-half smaller, and are chiefly found buried in mossy vegetation in brackish marshes.

PHACOIDES (PSEUDOMILTHA?) MEGAMERIS Dall

(Plate XLII, fig. 1.)

Lucina (Pseudomiltha?) megameris Dall, Nautilus, XV, 1901.

As this paper is composed of materials toward a monograph of American Lucinacea, it was thought that its interest might be added to by including a figure of the largest Lucinoid known, a hitherto unfigured species, represented by internal casts in the Oligocene of Clairemont, St. Anns, Jamaica, West Indies.

This remarkable fossil, represented by a number of specimens in the U. S. National Museum (Reg. No. 147592), weighs, without any extraneous matter, 7 pounds, and the measurements are: height, 230 mm.; length 235 mm.; diameter, 67 mm.

The largest species hitherto recorded is the *Lucina* (*Pseudomiltha*) *gigantea* Deshayes, from the Parisian Eocene, and that hardly exceeds 80 mm. in its maximum height.

If we except the Tridacnacea and a few Mytilacea, *Phacoides megameris* is one of the largest pelecypods known.

Supplementary note.—Some curious abyssal Pelecypods from the south Atlantic and the Philippines were described by E. A. Smith, in the Challenger Report, under the names of *Cryptodon moseleyi* and *C. luzonicus.* The valves are almost perfectly plain and the hinge edentulous. According to Pelseneer, the anatomy presents the following features: There is a single anal orifice, without valvular or siphonal prolongation; the foot is hatchet-shaped, compressed, and short, with a conspicuous byssal sulcus; the form and arrangement of the adductors recalls *Lepton* rather than *Lucina* or *Thyasira;* the gills have on each side a single direct and reflected lamina, as in *Lucina;* the hepatic and visceral glands are contained within the mass of the body; the anal and peripedal chambers are separated by the union of the gills posteriorly; the anterior edges of the mantle are thickened and specialized for some—not evident—function; the palps are much as in *Diplodonta.*

These two species are obviously not referable to *Thyasira*, and the simplicity of the shell, which recalls *Axinulus*, gives no clue even to the family to which they should be referred. On the anatomical evidence, I propose for them the generic name of *Vaticinaria.*

From *Thyasira* and its near allies, *Vaticinaria* differs by its lucinoid gills and the absence of hepatic digitations, as well as by the specialization of the anterior mantle margin.

From the *Diplodontidæ* (otherwise *Ungulinidæ*) it differs by its lucinoid gills, single siphonal orifice, flattened foot, and edentulous hinge. There is no evidence of any relations with the *Corbidæ* or *Cyrenellidæ.* By this elimination we are obliged to refer the genus to the *Lucinidæ*, of which it is perhaps a degenerate member. It may have lost (as many forms have) much of its character by long residence in the abyssal region. It is least unlike such a group as *Jagonia*, and at any rate can not be referred with propriety to either the *Thyasiridæ* or *Diplodontidæ.*

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EXLANATION OF THE PLATES.

Plate XXXIX.

Fig. 1. *Codakia* (*Jagonia*) *chiquita* Dall; Lower California; U. S. Nat. Mus. No. 96563; lon. 10.2 mm.; p. 823.

2. *Phacoides* (*Parvilucina*) *crenella* Dall; Florida; U. S. Nat. Mus. No. 60948; alt. 6.5 mm.; p. 825.

3. *Thyasira tomeana* Dall; Chile; U. S. Nat. Mus. No. 108907; alt. 14.7 mm.; p. 818.

4. *Phacoides* (*Parvilucina*) *approximatus* Dall; Gulf of California; U. S. Nat. Mus. No. 96418; alt. 6.5 mm.; p. 828.

5. *Phacoides* (*Callucina*) *bermudensis* Dall; Bermuda; U. S. Nat. Mus. No. 41339; lon. 15.5 mm.; p. 825.

6. *Codakia* (*Jagonia?*) *portoricana* Dall; Porto Rico; U. S. Nat. Mus. No. 108959; lon. 7.25 mm.; p. 822.

7. *Phacoides* (*Cavilucina*) *lingualis* Carpenter; Gulf of California; U. S. Nat. Mus. No. 73687; alt. 12.5 mm.; p. 827.

8. *Divaricella perparvula* Dall; Acapulco, Mexico; U. S. Nat. Mus. No. 120699; lat. 7.0 mm.; p. 829.

9. *Phacoides* (*Cavilucina*) *lamprus* Dall; Gulf of California; U. S. Nat. Mus. No. 41626; lon. 17.5 mm.; p. 827.

10. *Phacoides* (*Bellucina*) *amiantus* Dall; Yucatan Strait; U. S. Nat. Mus. No. 64276; alt. 7.6 mm.; p. 826.

11. *Phacoides* (*Bellucina*) *cancellaris* Philippi; Lower California; U. S. Nat. Mus. No. 96440; lon. 5.3 mm.; p. 829.

12. *Thyasira excavata* Dall; Gulf of California; U. S. Nat. Mus. No. 107449; alt. 21 mm.; p. 818.

13. *Phacoides* (*Lucinisca*) *nuttallii* Conrad, var. *centrifugus* Dall, young; Gulf of California; U. S. Nat. Mus. No. 108881; lon. 7.0 mm.; p. 828.

14. *Phacoides* (*Pleurolucina*) *undatus* Carpenter; Gulf of California; U. S. Nat. Mus. No. 73685; alt. 10 mm.; p. 826.

15. *Thyasira excavata* Dall; interior of valve represented by fig. 12, *supra*.

Plate XL.

Fig. 1. *Axinopsis viridis* Dall; Unalaska; U. S. Nat. Mus. No. 108925; lon. 6.2 mm. p. 819.

2. *Axinopsis sericatus* Carpenter; type specimen for comparison with fig. 1; Puget Sound; U. S. Nat. Mus. No. 5249; lon. 4.0 mm.; p. 819.

3. *Lucina phenax* Dall and Simpson; Porto Rico; U. S. Nat. Mus. No. 103951; alt. 9.0 mm.; p. 823.

4. *Codakia* (*Jagonia*) *galapagana* Dall; Galapagos Islands; U. S. Nat. Mus. No. 102454; lon. 23 mm.; p. 823.

5. *Phacoides* (*Parvilucina*) *tenuisculptus* Carpenter; Puget Sound; U. S. Nat. Mus. No. 108827; alt. 12 mm.; p. 828.

6. *Codakia* (*Jagonia*) *mexicana* Dall; Gulf of California; U. S. Nat. Mus. No. 101783; lon. 23 mm.; p. 822.

7. *Phacoides* (*Here*) *richthofeni* Gabb; young shell from Catalina Island, California; U. S. Nat. Mus. No. 108828; lon. 14.5 mm.; p. 827.

8. *Thyasira bisecta* Conrad (sp.), viewed from above; southeastern Alaska; U. S. Nat. Mus. No. 122556; lon. 50 mm.; p. 817.

9. *Phacoides* (*Here*) *richthofeni* Gabb, interior of the valve represented by fig. 7, showing excavation of lunule and muscular impressions.

FIG. 10. *Phacoides* (*Lucinoma*) *annulatus* Reeve, Vancouver Island; interior of shell; U. S. Nat. Mus. No. 150971; lon. 58 mm.; p. 824.

11. *Phacoides* (*Lucinoma*) *filosus* Stimpson; off Newport, Rhode Island; figured for comparison with the preceding; lon. 49 mm.; p. 824.

PLATE XLI.

FIG. 1. *Phacoides* (*Lucinoma*) *heroicus* Dall; western Mexico; U. S. Nat. Mus. No. 108818; lon. 71 mm.; p. 828.

2–3. *Phacoides* (*Lucinoma*) *æquizonatus* Stearns; Santa Barbara Channel, California; interior and exterior of shell; U. S. Nat. Mus. No. 104044; lon. 45 mm.; p. 813.

4. *Codakia colpoica* Dall; Gulf of California; U. S. Nat. Mus. No. 102435; lon. 76 mm.; p. 821.

PLATE XLII.

FIG. 1. *Phacoides* (*Pseudomiltha?*) *megameris* Dall, an internal cast from Clairemont, St. Ann's, Jamaica, West Indies, Oligocene Tertiary limestone; U. S. Nat. Mus. No. 147592; max. length 235.0 mm.; p. 829.

2. *Thyasira conia* Dall and Simpson, Porto Rico; U. S. Nat. Mus. No. 108949; alt. 5.5 mm.; p. 818.

3. *Diplodonta* (*torelli* Jeffreys, var. ?) *aleutica* Dall, young shell; Kyska Island, Aleutians; U. S. Nat. Mus. No. 108845; lon. 15.3 mm.; p. 820.

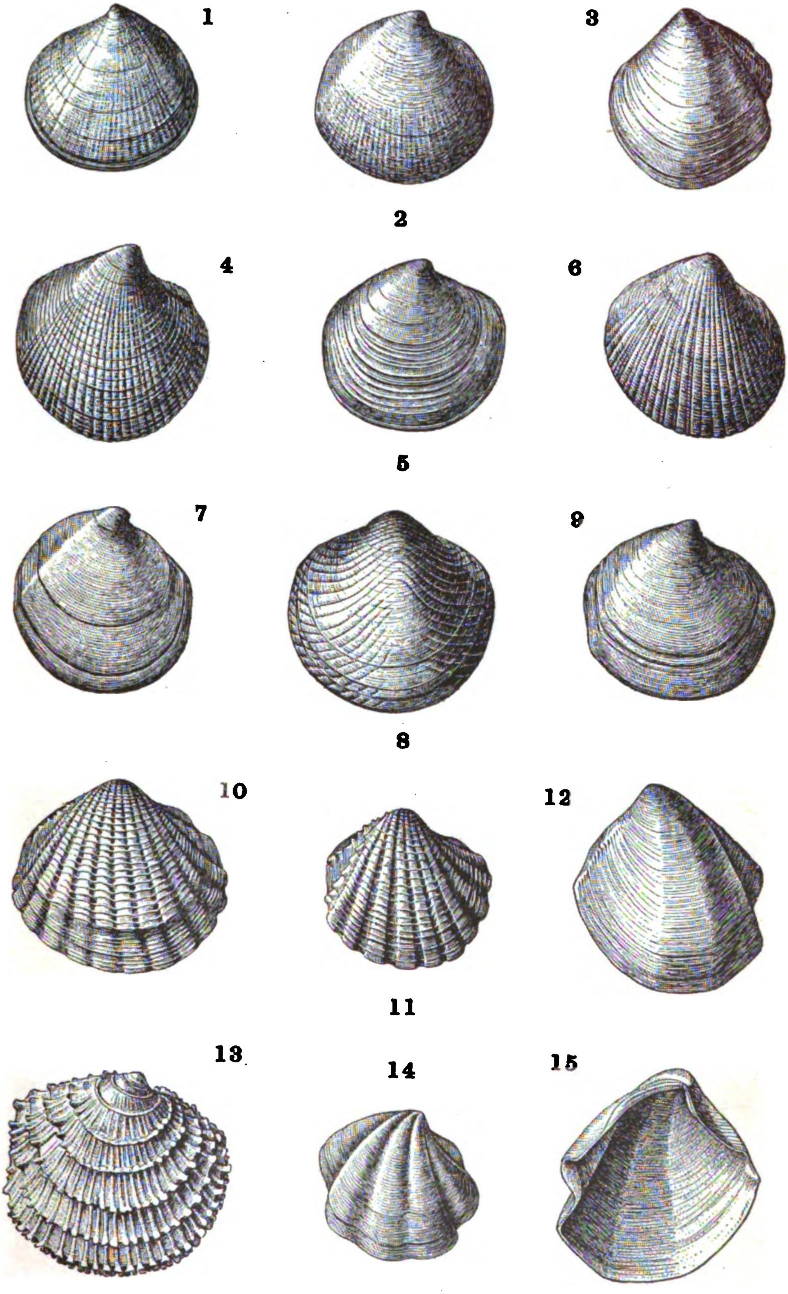
4. *Codakia cubana* Dall, off Cuban coast in the Gulf of Mexico; U. S. Nat. Mus. No. 64279; lon. 18.5 mm.; p. 821.

5. *Thyasira bisecta* Conrad (sp.), Alaska; U. S. Nat. Mus. No. 122556; lon. 50 mm.; p. 817.

6. *Thyasira magellanica* Dall, western Patagonia; U. S. Nat. Mus. No. 122745; alt. 4.7 mm.; p. 819.

7. *Cyrenoida floridana* Dall, Florida; U. S. Nat. Mus. No. 60973; lon. 14.0 mm.; p. 829.

8. *Phacoides* (*Callucina*) *radians* Conrad, Pensacola, Florida; U. S. Nat. Mus. No. 126914; alt. 20.0 mm.; p. 824.



Lucinacea of North America.

For explanation of plate see page 831.

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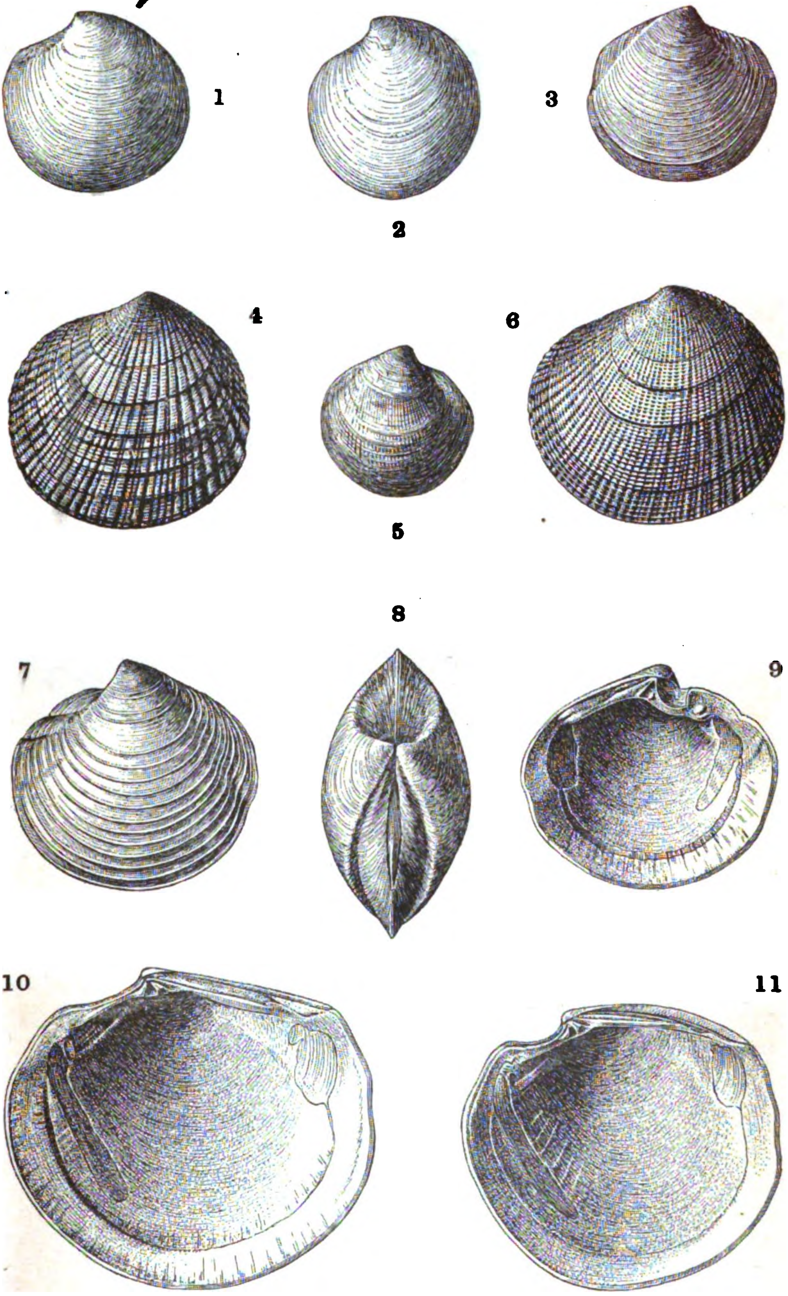
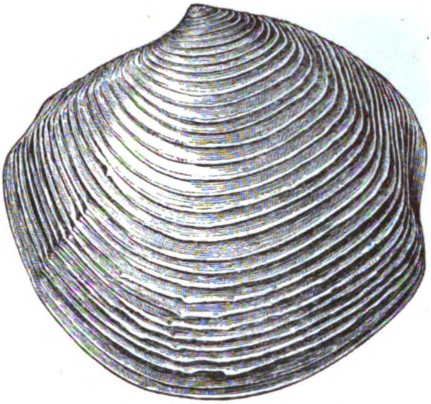


LUCINACEA OF NORTH AMERICA.

FOR EXPLANATION OF PLATE SEE PAGES 831, 832.



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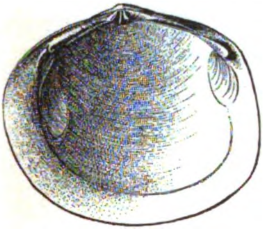

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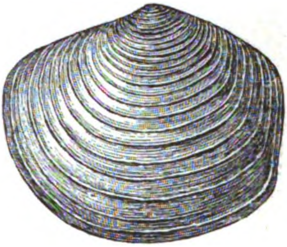

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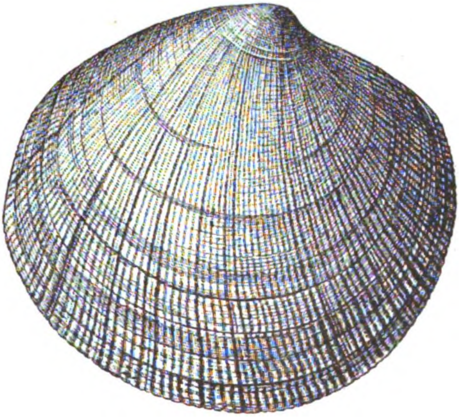

LUCINACEA OF NORTH AMERICA.

FOR EXPLANATION OF PLATE SEE PAGE 832.

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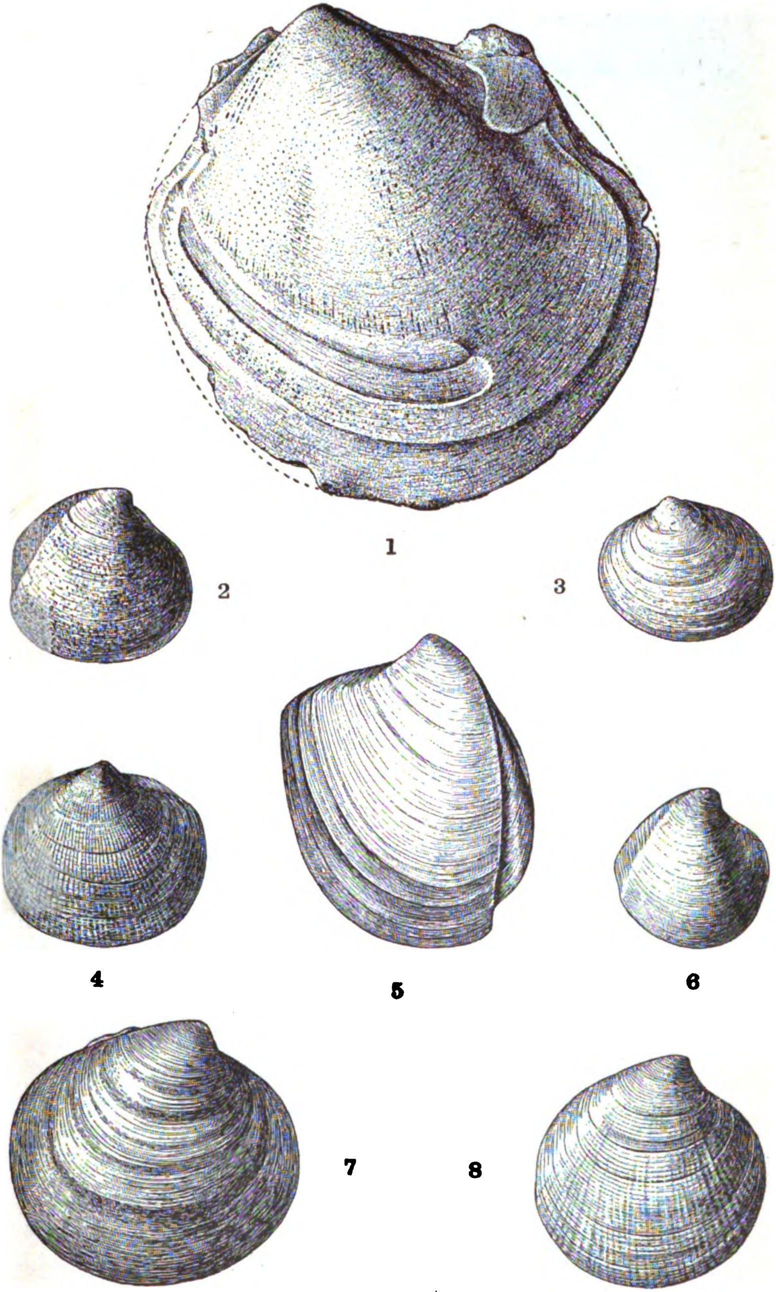

Lucinacea of North America.

For explanation of plate see page 832.

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ON A SLUG OF THE GENUS VERONICELLA FROM TAHITI.

By T. D. A. Cockerell,

Entomologist, College of Agriculture and Mechanic Arts, New Mexico.

During the expedition of the U. S. Fish Commission steamer *Albatross* to the South Seas, under the direction of Dr. Alexander Agassiz, collections were made on shore at various points and a few land mollusks were obtained. Among these was a specimen belonging to the genus *Veronicella*, naked slugs which are common to many warm countries and often very injurious to gardens. Being nocturnal in their habits and capable of extreme elongation, so that they can pass through very narrow chinks, they have been known to destroy an entire crop of early tomatoes on one of the Florida Keys without being detected until search was made at night with lanterns. During the hours of daylight they retreated to the interstices of the coral rock where in this case, although existing in immense numbers, they remained invisible. The present specimen was submitted to the author of this paper, who has made a special study of these animals, in order that the species might be determined and any facts of interest in regard to it be placed on record.

VERONICELLA AGASSIZI, new species.

Type.—No. 161956, U.S.N.M.

Description.—Length, about 21 mm.; breadth, 9½; breadth of sole, 3; female orifice from sole, 2, from margin, scarcely 2, from anterior end about 11 mm; these measurements all from a dried individual. Dorsal surface granular with small warts; color, coffee-brown marbled with black; no dorsal band. Under surface whitish. Anatomy not determinable from the material available.

Habitat.—Tahiti; Tipaerui Valley, under bark of dead trees, collected by Dr. Alexander Agassiz. (*Albatross* expedition.)

Apparently nearest to *V. gilsoni* Collinge, from the Fiji Islands, but the sole is broader (*agassizi* 3, *gilsoni* 2.5 mm.) and the female generative orifice appears to be more distant from the sole. In size and color the animal agrees fairly well with *gilsoni;* at least, the difference of color might be due to variation. From *V. brunnea* Collinge, of the New Hebrides, our animal differs in the position of the female generative orifice. *V. plebeia* Fischer, from New Caledonia, may also be compared.

It will be noticed that the species of the Pacific Islands are all very small.

If this species inhabited some continental area, it would not appear worth while to describe the inadequate material obtained; but the occurrence of a *Veronicella* in Tahiti is so interesting that it seems desirable to call attention to it. The marine currents appear to set from Tahiti toward the Fijis, New Caledonia, etc., so it does not seem likely, on the surface of things, that the *Veronicella* reached Tahiti on floating trees. Tahiti also seems to be out of the way of commerce from the islands westward, though this is a matter on which I am not well informed.

It may be useful to give a list of the species of *Veronicella* described from the Asiatic and Pacific islands since the publication of the check-list of slugs in 1893.

VERONICELLA SCHNEIDERI (Simroth).

Vaginula schneideri SIMROTH, SB. Ges. Leipzig, XIX (1895), p. 7—Sumatra.

VERONICELLA GIGANTEA (Godwin-Austen).

Vaginula gigantea GODWIN-AUSTEN, Proc. Zool. Soc. London, 1895, p. 451—Andaman Islands.

VERONICELLA DJILOLOENSIS (Simroth).

Vaginula djiloloensis SIMROTH, Abh. Senckenb. Ges., XXIV, p. 140—Halmahera, Moluccas.

VERONICELLA BORNEENSIS (Simroth).

Vaginula borneensis SIMROTH, Abh. Senckenb. Ges., XXIV, p. 142—Borneo.

VERONICELLA MELATOMUS (Sarasin).

Vaginula melatomus SARASIN, Die Land-Mollusken von Celebes (1899), p. 70—Celebes.

VERONICELLA BOVICEPS (Sarasin).

Vaginula boviceps SARASIN, Die Land-Mollusken von Celebes (1899), p. 70—Celebes.

VERONICELLA BRUNNEA Collinge.

Veronicella brunnea COLLINGE, Willey's Zoological Results, 1899, pt. iv, p. 435—New Hebrides.

VERONICELLA GILSONI Collinge.

Veronicella gilsoni COLLINGE, Journ. of Malac., VII (1900), p. 179—Fiji Islands.

VERONICELLA WILLEYI Collinge.

Veronicella willeyi COLLINGE, Willey's Zoological Results, 1899, pt. iv, p. 431—Loyalty Islands.

A REVIEW OF THE APODAL FISHES OR EELS OF JAPAN, WITH DESCRIPTIONS OF NINETEEN NEW SPECIES.

By David Starr Jordan and John Otterbein Snyder,

Of the Leland Stanford Junior University.

In the following paper is given an account of the species of apodal or eel-like fishes known from the waters of Japan. The paper is based on the collection made by the authors in the waters of Japan during the summer of 1900, under the auspices of the Hopkins Seaside Laboratory, the series of Japanese fishes belonging to the United States National Museum, and specimens collected by the United States Fish Commission steamer *Albatross*. The collection made by the authors is in the museum of Leland Stanford Junior University, a series having been also deposited in the United States National Museum. The accompanying drawings are the work of Miss Lydia M. Hart.

The apodal fishes agree in the eel-like form of the body, the degradation of the skeleton, and the deterioration of the fins and their basal segments.

Among the apodal fishes of Japan two orders are recognized; one, *Symbranchia*, has the structure of the mouth characteristic of ordinary fishes; the other, *Apodes*, has the premaxillaries atrophied or lost.

Order SYMBRANCHIA.

Body eel-shaped; prémaxillary, maxillary, and palatine bones well developed and distinct from each other, as in ordinary fishes. Shoulder girdle joined to the skull in typical species (in one family, *Amphipnoidæ*, distinct from the skull as in the eels). No mesocoracoid; symplectic present or absent; scales minute or wanting; no paired fins; vertical fins rudimentary, reduced to folds of the skin; vent at a great distance from the head; gill openings confluent in a single slit; no air bladder; stomach without blind sac or pyloric cæca; ovaries with oviducts; skull solid, the bones firmly united; vertebræ numerous, the anterior unmodified. Eel-like fishes, widely distributed in warm seas and in fresh waters. The species are few, but highly diversified in structure, constituting two suborders and four families. They are probably related to the *Apodes*, but this is not certain, and in the structure of the head they approach more nearly to the true fishes. They represent degraded rather than primitive types, and the line of their descent is as yet unknown. It is not even certain that the forms grouped in this order are closely related. (*σύν* together; *βράγχια*, gills.)

Family I. MONOPTERIDÆ.

RICE-FIELD EELS.

Body elongate, naked; tail short, tapering to a point; no barbels; margin of the upper jaw formed by the premaxillaries, the maxillaries well developed, lying behind them and parallel with them; lips thick; palatine teeth small, in a narrow band; gill openings confluent into a ventral slit, the membranes united to the isthmus; gill arches three, with the gill-fringes rudimentary, and with moderate slits between them; no accessory breathing sac; lateral line present; no pectoral or ventral fins; dorsal and anal reduced to low folds; ribs present; no air bladder; stomach without cæcal sac or pyloric appendages. Ovaries with oviducts. Vertebræ $100 + 88 = 188$.

Eel-like fishes of the rivers of eastern Asia, everywhere abundant, probably all reducible to one single species.

1. MONOPTERUS Lacépède.

Monopterus Lacépède, Hist. Nat. Poiss., II, 1798, p. 139 (*javanensis*).
Fluta Schneider, Syst. Ichth., 1801, p. 565 (*javanensis*).
Ophicardia McClelland, Calcutta Journ. Nat. Hist., V, p. 191 (*phayriana*).
Apterigia Basilewsky, Nouv. Mém. Soc. Nat. Mosc., X, 1855, p 247 (*saccogularis*).

Characters of the genus included above. (*μόνος*, one; *πτερόν*, fin.)

1. MONOPTERUS ALBUS (Zuiew).

Muræna alba Zuiew, Nov. Act. Ac. Sci. Petropol, 1793, p. 299, pl. vii, fig. 2.

Monopterus javanois Lacépède, Hist. Nat. Poiss., II, 1798, p. 139, Java.

Monopterus javanensis Schneider, Syst. Ichth., 1801, p. 565, after Lacépède.—Cantor, Malayan Fish, 1850, p. 339, pl. v, figs. 6–8.—Bleeker, Atlas Ichth. Mur. 1864, p. 118, pl. xlvii, fig. 1, Java, Sumatra, Banka, Bintang, Borneo, Celebes.—Günther, Cat. Fish., VIII, 1870, p. 14, Batavia, Borneo, Sarawak, Siam, Formosa, Chusan, Hongkong, Ningpo, North China, Japan, and of authors generally.

Unibranchapertura lævis Lacépède, Hist. Nat. Poiss., V, 1803, p. 658, pl. xvii, fig. 3.

Monopterus lævis Richardson, Voy. Sulphur, Ichth., p. 116, Hongkong.

Symbranchus eurychasma Bleeker, Verh. Bat. Gen. Muræn, XXV, p. 60.

Ophicardia phayriana McClelland, Calcutta Journ. Nat. Hist., V, pp. 191, 218, pl. xii, fig. 1, River Ganges.

Monopterus cinereus RICHARDSON, Voyage Sulphur, p. 117, pl. LII, figs. 1–6 (Excl. syn.), Chusan, Woosung.

Monopterus (*?*) *xanthognathus* RICHARDSON, Voy. Sulphur, p. 118, pl. LII, fig. 7, Canton.

Monopterus marmoratus TEMMINCK and SCHLEGEL, Richardson, Ichth. China, 1846, p. 315, Chusan.

Monopterus helvolus RICHARDSON, Ichth. China, p. 316, Canton.

Apterigia saccogularis BASILEWSKY, Nouv. Mém. Soc. Nat. Moscow, X, 1855, p. 247, pl. VIII, fig. 2, Tschili.

Apterigia nigromaculata BASILEWSKY, Nouv. Mém. Soc. Nat. Moscow, X, p. 248, pl. II, fig. 2, Peking.

Apterigia immaculata BASILEWSKY, Nouv. Mém. Soc. Nat. Moscow, X, p. 248, Peking.

Head 13 in length, its depth greater than that of body, 1⅔ in its length; depth 22 (17 to 26) in length. Jaws heavy, the lower shorter; maxillary 2 in head; teeth small, mostly uniserial. Eye very small, over middle of maxillary. Gill openings inferior, confluent in a semicircular slit. Tail very short, pointed, 2¾ in rest of body. Dorsal fin very low, beginning close behind vent. Anal very indistinct, about half length of dorsal; no pectorals. Color in spirits blackish olive, with traces of darker and paler streaks and mottlings; a dark cross-band behind head; in life with yellowish streaks and dashes and dark dots above.

Length 1 to 2 feet.

Fresh waters and rice ditches of China, Korea, and southward to Java, Borneo, and Siam, north to the Riu Kiu Islands; our specimens, four in number, were collected by Mr. Tashiro on the island of Okinawa, where it is known as Ta-unagi or rice-field eel. The present description is taken from specimen No. 69, in the Imperial Museum at Tokyo, from the island of Amami-Oshima in the northern Riu Kiu group. It is a foot in length. The specimen is recorded as "*Moringua javanica*" in Dr. Ishikawa's list. (*albus*, white.)

Order APODES.

EELS.

Teleost fishes with the premaxillaries atrophied or lost, the maxillaries lateral, and the body anguilliform and destitute of ventral fins. The most striking feature is the absence of the premaxillaries, taken in connection with the elongate form and the little development of the scapular arch, which is not attached to the cranium. Other characters not confined to the Apodes are the following: The absence of the symplectic bone, the reduction of the opercular apparatus and of the palatopterygoid arch, the absence of ventral fins, the absence of the mesocoracoid or præcoracoid arch, and the reduction or total absence of the scales. There are no spines in the fins, the gill openings are comparatively small, and there are no pseudobranchiæ. The vertebræ are in large number and none of them are specially modified. The tail is isocercal—that is, with the caudal vertebræ remaining in a straight line to its extremity, as in the embryos of most fish, and in the *Anacanthini*.

We begin our discussion of the eels with the forms which seem nearest to the primitive stock from which the members of the group have descended. It is evident that among the eels the forms of simplest structure, *Sphagebranchus*, etc., are not in any sense primitive forms, but the results of long-continued and progressive degeneration, so far as the fins and mouth parts are concerned. The *Apodes* are probably descended from soft-rayed fishes, and their divergence from typical forms is, in most respects, a retrogression. (ἀ-without; πούς, foot, from the absence of ventral fins.)

FAMILIES OF APODES.

a. *Enchelycephali:* Gill openings well developed, leading to large interbranchial slits; tongue present; opercles and branchial bones well developed; scapular arch present.

b. Skin covered with rudimentary embedded scales, usually linear in form, arranged in small groups, and placed obliquely at right angles to those of neighboring groups; pectorals and vertical fins well developed, the latter confluent about the tail; lateral line present; posterior nostril in front of eyes; tongue with its margins free.

c. Gill openings well separated; branchiostegals long, bent upwards behind.

d. Gill openings lateral and vertical; snout conic, the jaws not very heavy; gape longitudinal; lips thick; lower jaw projecting; teeth in cardiform bands on jaws and vomer; eggs minute................ANGUILLIDÆ. II.

cc. Gill openings inferior, very close together, apparently confluent; branchiostegal rays abbreviated behind; head conical; tongue small; posterior nostrils in front of eye...........................SYNAPHOBRANCHIDÆ. III.

bb. Scales wholly wanting; eggs, so far as known, of moderate size, much as in ordinary fishes.

e. Tail not much if any shorter than rest of body; heart placed close behind the gills.

f. Tip of tail with a more or less distinct fin, the dorsal and anal fins confluent around it; the tail sometimes ending in a long filament. Coloration almost always plain, brownish, blackish, or silvery, the fins often black-margined.

g. Posterior nostril without tube, situated entirely above the upper lip.

h. Tongue broad, largely free anteriorly and on sides; vomerine teeth moderate.

i. Pectoral fins well developed; body not excessively elongate; lower jaw not projecting; anterior nostril remote from eye.
LEPTOCEPHALIDÆ. IV.

hh. Tongue narrow, adnate to the floor of the mouth or only the tip slightly free; vomerine teeth well developed, sometimes enlarged.

j. Jaws not attenuate and recurved at tip; gill openings well separated; anterior nostril remote from eye.

k. Pectoral fins well developed; skin thick; skeleton firm; snout moderate; tail not ending in a filiform tip.
MURÆNESOCIDÆ. V.

kk. Pectoral fins wholly wanting; snout and jaws much produced, the upper longer; jaw straight; skin thin, the skeleton weak; tail ending in a filiform tip; gill openings small, subinferior; teeth sharp, subequal, recurved; a long series on the vomer; deep-sea eels, soft in body.
NETTASTOMIDÆ. VI.

gg. Posterior nostril close to the edge of the upper lip; tongue more or less fully adnate to the floor of the mouth; teeth subequal.
MYRIDÆ. VII.

ff. Tip of tail without rays, projecting beyond the dorsal and anal fins, (not filiform); posterior nostril on the edge of the upper lip; anterior nostril near tip of snout, usually in a small tube; tongue usually adnate to the floor of the mouth. Coloration frequently variegated.
OPHICHTHYIDÆ. VIII.

ee. Tail much shorter than the trunk; heart situated at a great distance behind the gills; pectorals small or wanting; vertical fins little developed; body slender, cylindrical; gill openings narrow, inferior.
MORINGUIDÆ. IX.

aa. *Colocephali:* Gill openings small, roundish, leading to restricted interbranchial slits; tongue wanting; pectoral fins (typically) wanting; opercles feebly developed; fourth gill arch modified, strengthened, and supporting pharyngeal jaws.

l. Scapular arch obsolete or represented by cartilage; heart not far back; pectorals wanting; skin thick; coloration often variegated .... MURÆNIDÆ. X.

Family II. ANGUILLIDÆ.

TRUE EELS.

The true eels, or *Anguillidæ*, are characterized by their scaly skin in association with a conical head and a general resemblance to the *Congers*. The group is thus diagnosed by Dr. Gill: "Enchelycephalous Apodals with conical head, well-developed opercular apparatus, lateral maxillines, cardiform teeth, distinct tongue, vertical lateral branchial apertures, continuous vertical fins, with the dorsal far from the head, pectorals well developed, scaly skin, and nearly perfect branchial skeleton."

The *Anguillidæ* approach more nearly than most of the other eels to the type of the true fishes. In one respect, that of the minute ova and concealed generation, however, they differ widely from these. The single genus of living *Anguillidæ* is widely diffused in temperate and tropical waters. Unlike the other eels the *Anguillidæ* freely ascend the rivers, descending to the sea for purposes of reproduction. One genus, with five or more valid species.

a. Dorsal fin inserted well behind base of pectorals; shoulder girdle well developed; lower jaw projecting .... *Anguilla.* 2.

2. ANGUILLA Shaw.

EELS.

Anguilla Shaw, General Zoölogy, IV, 1804, p. 15 (*anguilla*).

Muræna Bleeker, Poey, etc. (taking as type *Muræna anguilla*, the first species mentioned by Artedi under *Muræna*).

Body elongate, compressed behind, covered with embedded scales which are linear in form and placed obliquely, some of them at right angles to others. Lateral line well developed. Head long, conical, moderately pointed, the rather small eye well forward and over the angle of the mouth. Teeth small, subequal, in bands on each jaw and a long patch on the vomer. Tongue free at tip. Lips rather full, with a free margin behind, attached by a frenum in front. Lower jaw projecting. Gill openings rather small, slit-like, about as wide as base of pectorals and partly below them. Nostrils superior, well separated, the anterior with a slight tube. Vent close in front of anal. Dorsal inserted at some distance from the head, confluent with the anal around the tail. Pectorals well developed. Species found in most warm seas (the eastern Pacific excepted), ascending streams, but mostly spawning in the sea. The eels often move for a considerable distance on land in damp grass. Waterfalls, dams, and other obstructions are often passed in this way. It is thought that the eel spawns only in the sea, the female dying after having once produced ova. The females are larger than the males, paler in color, with smaller eyes and higher fins. Eels are among the most voracious of fishes. "On their hunting excursions they overturn alike huge and small stones, beneath which they find species of shrimp and crayfish, of which they are excessively fond. Their noses are poked into every imaginable hole in their search for food, to the terror of innumerable small fishes." The single Japanese species differs very slightly, if at all, from the American eel *Anguilla chrysypa*. (*Anguilla*, the eel.)

2. ANGUILLA JAPONICA Schlegel.

UNAGI (EEL); O-UNAGI (GREAT EEL); GOMA-UNAGI (CARAWAY-SEED OR SPECKLED EEL).

Anguilla japonica Schlegel, Fauna Japonica, 1847, p. 258, pl. cxiii, fig. 2, Nagasaki.—Bleeker, Verh. Bot. Gen., XXV, Japan, p. 51.—Kner, Novara Fische, p. 370.—Jordan and Snyder, Proc. U. S. Nat. Mus., 1900, p. 348, Yokohama.

Muræna pekinensis Basilewsky, Nouv. Mém. Soc. Nat. Mosc., X, 1855, p. 246, pl. iii, fig. 2, Pekin.

Anguilla vulgaris, *bengalensis*, and *mauritiana* Ishikawa, Prel. Cat. Fish, p. 7, 1897, Hitaka, Tokyo, Hashigo, Zensho, Sagami, Awa, Kadzusa.

Head about 2¼ in trunk, upper jaw 3½ in head, distance from front of dorsal to vent a little less than head; pectoral, 3 in head; distance from snout to dorsal, 3¼ in length. Dark brown or yellowish brown above, rarely marbled; abruptly paler below; pectoral pale; dorsal, anal, and caudal edged behind with black. Length, 2 to 5 feet. Streams, lakes, and estuaries of Japan, almost everywhere very common; our specimens from Hakodate, Aomori, Same, Matsushima, Sendai, Tokyo, Misaki, Wakanoura, Omura Bay, Kurume, and Nagasaki.

In southern Japan very large examples 4 or 5 feet long are sometimes taken. The species is very similar to the American eel (*Anguilla chrysypa* Rafinesque), differing in a very slightly more anterior dorsal and more blackish edging to the fins behind, matters of very slight importance. This species is known to fishermen as "unagi," the very large ones as "ounagi," or great eel. The name "goma-unagi," or caraway-seed eel, is given to speckled individuals.

Family III. SYNAPHOBRANCHIDÆ.

This group consists of deep-sea eels, differing from the *Anguillidæ* in having the gill openings externally confluent into a single slit. The following diagnosis is given by Dr. Gill:

Enchelycephalous apodals, with conic, pointed head; moderate opercular apparatus, lateral maxillines, cardiform teeth, distinct tongue, inferior branchial apertures discharging by a common aperture, continuous vertical fins, pectorals well developed, scaly skin, and nearly perfect branchial skeleton.

Body eel-shaped, covered with linear, embedded scales placed at right angles, as in *Anguilla*. Lateral line present. Head long and pointed, the snout produced. Mouth very long, the eye being over the middle of its cleft. Jaws about equal; teeth small, sharp, in a broad band in each jaw, becoming a single series anteriorly; those of inner series in upper jaw and of outer series in mandible somewhat enlarged; vomerine teeth in a narrow band anteriorly. Gill openings inferior, horizontal, close together, convergent forward, somewhat confluent at the surface, but separated by a considerable isthmus within. Branchiostegals peculiarly formed, in moderate number (about 15), attached to the sides of the compressed ceratohyal and epihyal, slender, abbreviated, and moderately bowed, not being curved up above the operculum. Tongue long, free only at the sides. Nostrils large, the anterior with a short tube, the posterior before the lower part of the eye. Pectoral well developed; dorsal low, beginning behind vent; anal longer than dorsal, rather high, its rays slender, branched, not embedded in the skin; vertical fins confluent around the tail. Vent near the anterior fourth of the body. Muscular and osseous system well developed. Stomach very distensible. Deep-sea fishes; two genera, with 6 or 8 species known.

a. Dorsal fin low, beginning behind vent; vomerine teeth in a single patch; pectorals long, longer than the rather slender snout .... *Synaphobranchus*. 3.
aa. Dorsal fin beginning close behind base of pectorals; vomerine teeth in two patches, one behind the other; pectorals short, not longer than the short snout .... *Histiobranchus*. 4.

3. SYNAPHOBRANCHUS Johnson.

Synapholbranchus JOHNSON, Proc. Zoöl. Soc. London, 1862, p. 169, (*kaupii*).

Dorsal beginning behind vent. This genus contains two or three species, deep-sea fishes from the Atlantic and Pacific. (*συναφής*, united; *βράγχια*, gills.)

a. Dorsal inserted directly over or very slightly behind vent .... *affinis*. 3.
aa. Dorsal inserted behind vent at a distance equal to three-fifths length of head *iraconis*. 4.
aaa. Dorsal inserted behind vent at a distance equal to length of head.... *jenkinsi*. 5.

3. SYNAPHOBRANCHUS AFFINIS (Günther).

Synaphobranchus affinis GÜNTHER, Ann. and Mag. Nat. Hist., XX, 1877, p. 445, Enoshima (misprinted Inosima), Japan.—JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 348 (off Tokyo; *Albatross* Coll.).

Dorsal fin beginning very close behind vent; head and trunk, 2⅔ in tail; maxillary, 1⅔ in head, not nearly reaching gill opening; head, 2⅓ in distance from tip of snout to dorsal, 1⅓ in trunk; snout, 3 in head; eye, 2 in snout; cleft of mouth, 1⅗ in head; pectoral, 2½ in head; its insertion nearer snout than anus. Uniform bluish brown, with fine dots; pores of lateral line pale, about 20 before vent; pectorals pale; vertical fins darker behind, light-edged anteriorly; inside of mouth blue-black; gill openings dark. Coasts of Japan and southward to the Philippines, in 400 to 600 fathoms; not rare; our numerous specimens from Totomi Bay (off Hamamatsu), station 2730, *Albatross;* off Tokyo, collection of U. S. Fish Commission steamer *Albatross*, and off Misaki (collection of Alan Owston). The species is very close to *S. pinnatus* of the Atlantic, which Dr. Günther regards in the Challenger Report as the same species. He gives a good figure of a specimen from south of Tokyo,[1] under the name of *Synaphobranchus pinnatus*. The species described and figured by Jordan and Evermann, following Goode and Bean, under the name of *Synaphobranchus pinnatus* is evidently different, having the dorsal much farther back. (*S. affinis*, related to *S. pinnatus*.)

4. SYNAPHOBRANCHUS IRACONIS Jordan and Snyder, new species.

Dorsal fin beginning far behind vent at a distance equal to ⅗ the head's length; maxillary, 1½ in head; head, 1⅖ in trunk; head and trunk, 2⅗ in tail; snout, 3⅕ in head; eye, 2⅕ in snout; pectoral, long,

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[1] Challenger Report, p. 253, pl. LXII, fig. A.

1⅘ in head, its insertion nearer tip of snout than vent. Uniform dull brown. One specimen taken in 200 fathoms depth off the coast of Myiako, in Rikuchu (north of Sendai), by Mitonubu Irako, director of the Museum of Morioka, and by him presented to the museum of Stanford University. The species is related to *Synaphobranchus brevidorsalis*, figured by Günther from the coast of New Guinea. The greater length of the tail, the larger mouth, larger pectoral, and especially the anterior insertion of the dorsal should separate the present species.

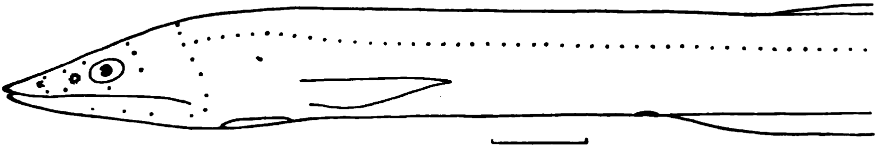

FIG. 1.—SYNAPHOBRANCHUS IRACONIS.

Type.—No. 6465, Leland Stanford Junior University Museum.

Named for Mitonubu Irako.

5. SYNAPHOBRANCHUS JENKINSI Jordan and Snyder, new species.

Head, 1⅜ in trunk; head and trunk, 2⅜ in tail; distance from snout to front of dorsal, 2⅘ in total length; distance from vent to front of dorsal equal to head; snout, 3 in head; cleft of mouth, 1⅘ in head; teeth very small, subequal; eye, 2 in snout; pectoral, 2½ in head.

Color brown above, purplish black below, and on head and lining membranes.

This species is allied to *Synaphobranchus brevidorsalis* Günther, from the Philippines, but the insertion of the dorsal is much in front of the middle of the body, while in the latter species it is much behind.

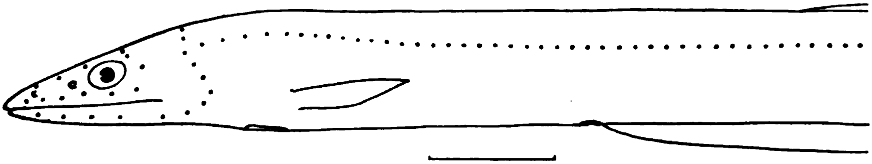

FIG. 2.—SYNAPHOBRANCHUS JENKINSI.

One specimen, 16½ inches long (Type No. 49727, U.S.N.M.), from Station 3696, in Sagami Bay, off Enoshima, taken by the U. S. Fish Commission steamer *Albatross* in 1901. Doubtless the specimen referred to *Synaphobranchus brevidorsalis* from the Hyalonema ground, off Enoshima, belongs to this species.

Named for Dr. Oliver Peebles Jenkins, in recognition of his work on the fishes of Hawaii.

4. HISTIOBRANCHUS Gill.

Histiobranchus GILL, Proc. U. S. Nat. Mus., 1883, p. 255 (*infernalis*).

This genus is close to the preceding, from which it is distinguished by the more anterior insertion of its dorsal. Two species have been described, perhaps identical with each other. (*ἱστίον*, sail, i. e., dorsal fin; *βράγχια*, gills; from the insertion of the dorsal.)

6. HISTIOBRANCHUS BATHYBIUS (Günther.)

Synaphobranchus bathybius GÜNTHER, Ann. and Mag. Nat. Hist., XX, 1877, p. 445; and in Voy. Challenger, 1887, p. 254, pl. LXII, fig. b, off Tokyo, North Pacific, Kerguelen Island.

Histiobranchus bathybius JORDAN and EVERMANN, Fish. N. M. America, I, 1896, p. 352, Bering Sea.

Pectoral fin longer than snout; eye one-half or two-thirds of the length of snout; head and trunk 1¼ in tail; dorsal beginning above or immediately behind the pectoral, which is only one-third length of head; scales quite rudimentary, lanceolate, imbedded in the skin; cheeks naked; dorsal and anal fins low, especially the former. Uniformly black. (Günther.) Northern and western Pacific in deep water off Tokyo, not obtained by us; one specimen taken in Bering Sea in 1890. (*βαθύς*, deep; *βίος*, life.)

Family IV. LEPTOCEPHALIDÆ.

CONGER EELS.

This family includes those eels which are scaleless, and have the tongue largely free in front, the body moderately elongate, the end of the tail surrounded by a fin, the posterior nostril remote from the upper lip and near front of eye, and the pectoral fins well developed. Lower jaw more or less included; teeth on sides forming a cutting edge; lateral line well developed. All the species are plainly colored, grayish or dusky above, silvery below. Species found in most warm seas, usually at moderate depths. Most of the species undergo a metamorphosis, the young being loosely organized and transparent, band-shaped, and with very small head. The body grows smaller with increased age, owing to the compacting of the tissues. The two genera found in Japan are not well separated and should perhaps be reunited.

a. Insertion of dorsal over or behind middle of pectoral; tail notably longer than rest of body; muciferous cavities of skull small ....*Leptocephalus*. 5.
aa. Insertion of dorsal before middle of pectoral; snout and mouth smaller; skull more cavernous.
  b. Teeth mostly pointed;[1] tail not half longer than rest of body.....*Congrellus*. 6.

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[1] Teeth blunt or molar in *Congermuræna* (type *habenata*).

5. LEPTOCEPHALUS Scopoli.

CONGER EELS.

(a) Larval forms.

Leptocephalus Scopoli, Int. Hist. Nat., 1777, p. 453 (*morrissi*).
Oxyurus Rafinesque, Caratteri, 1810, p. 19 (*vermiformis*).
Helmictis Rafinesque, Indice d'Ittiologia Siciliana, 1810, p. 62 (*punctatus*).
Helmichthys Costa, Fauna Napoli, Pesci, 1854 (*diaphanus*).
?*Leptocephalichthys* Bleeker, Act. Soc. Sci. Ind. Nederl., I, Manado, p. 69 (*hypselosoma*).
?*Diaphanichthys* Peters, Monatsber. Ak. Wiss. Berl., 1864, p. 399 (*brevicaudus*).

(b) Adult forms.

Echelus Rafinesque, Caratteri, etc., 1810, p. 63 (in part, includes species of *Conger*, *Ophisoma*, and *Myrus;* restricted by Bleeker to *Myrus*).
Conger Cuvier Règne Animal, 2d ed., 1829, p. 350 (*conger*).
Ariosoma Swainson, Nat. Hist. Class'n Fishes, I, 1838, p. 220 (no type mentioned; diagnosis worthless).
Ophisoma Swainson, Nat. Hist. Class'n Fishes, II, 1839, p. 334 (*acuta*). Substitute for *Ariosoma;* not *Ophisomus*, Swainson, Nat. Hist., Class'n Fishes, II, 1839, p. 227 = *Muraenoides*, Lacépède.
Congrus Richardson, Voyage Erebus and Terror, p. 107, 1844 (*conger*).
? *Gnathophis* Kaup, Aale Hamburg. Mus., 1859, p. 7 (*heterognathus*).

Body formed as in *Anguilla*, the skin scaleless. Head depressed above, anteriorly pointed. Lateral line present. Mouth wide, its cleft extending at least to below middle of eye. Teeth in outer series in each jaw equal and close-set, forming a cutting edge; no canines; band of vomerine teeth short. Tongue anteriorly free. Vertical fins well developed, confluent around the tail; pectoral fins well developed; dorsal beginning close behind pectorals. Gill openings rather large, low. Eyes well developed. Posterior nostril near eye; anterior near tip of snout, with a short tube. Lower jaw not projecting. Skeleton differing in numerous respects from that of *Anguilla*. Vertebræ about 56 + 100. In most warm seas. This genus contains the well-known and widely distributed Conger eel and three or four closely related species. The earliest generic name used for members of the group is *Leptocephalus*, based on a curious, elongate, transparent, band-like creature with minute head and very small mouth, found in the waters of Europe, and known as *Leptocephalus morrissi*. This has been shown by Gill, Günther, and Facciolá to be the young and larval form of *Leptocephalus conger*. A number of the genera and species of the supposed family of Leptocephalidæ have been described, but there is no doubt that all of them are larvæ—some of eels, as *Conger*, *Congermuræna*, *Nettastoma*, and *Oxystomus;* others of Isospondylous fishes, as *Albula*, *Elops*, *Alepocephalus*, *Stomias*, etc.[1] It is thought by Dr.

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[1] Günther, Cat., VIII, p. 136.

Günther that the Leptocephalid forms are probably "individuals arrested in the development at a very early period of their life, yet continuing to grow to a certain size, without corresponding development of their internal organs, and perishing without having attained the characters of the perfect animal." The recent observations of Dr. Gilbert on the larvæ of *Albula*, *Elops*, and *Conger*, however, seem to point to the conclusion that these curious forms are normal young, and that the individuals grow smaller in size for a time with increased age, owing to the increasing compactness of the tissues.

Inasmuch as the name *Leptocephalus* has been associated for more than a century with larval forms, it is a decided inconvenience to accord to it precedence as a generic name over *Conger*. The strict law of priority, however, demands its retention, and the tendency among systematic zoologists is to recognize as few exceptions as may be to this rule. The unfamiliar names *Oxyurus* and *Helmictis* are both earlier than *Conger*. (λεπτός, slender; κεφαλή, head.)

The species of this genus are very difficult to determine. Among those found in Japan four are unquestionably valid *myriaster*, *japonicus*, *nystromi*, and *retrotinctus*, but the other three may be forms of *japonicus*.

a. Lateral line with each pore in the center of a whitish spot, these close set, as wide as the interspaces; about 38 before vent; head above with cross-series of many white pores, obscure in the young; adult with a series of round, wide-set whitish spots on each side of back; lower jaw included; pectoral more or less dusky, the dorsal inserted nearly above its tip; dorsal and anal with broad black margin .... *myriaster*. 7.

aa. Lateral line without pale dots or with them very inconspicuous, not so broad as the interspaces; head with cross-series of conspicuous pores, the pores uncolored, like pin pricks; no pale spots on sides of back.

b. Dorsal fin beginning over or behind tip of pectoral; pores before vent about 40; maxillary reaching posterior border of pupil; pectorals chiefly black; dorsal and anal with broad black margin.

c. Head, 1¾ in trunk; head and trunk, 1¾ in tail .... *erebennus*. 8.

cc. Head, 1⅓ in trunk; head and trunk, 1½ in tail .... *kiusiuanus*. 9.

d. Pectorals pale; dorsal and anal with very little black margin or none; head and trunk, 1⅔ in tail .... *japonicus*. 10.

bb. Dorsal fin beginning nearly over middle of pectoral; dorsal and anal with broad black margins.

e. Dorsal and anal each with a broad margin for their whole length. Mouth large, the maxillary extending to posterior margin of eye; eye, 6½ in head; jaws subequal; tail twice length of rest of body; 36 whitish pores in advance of vent; no white spots on sides of back; dorsal and anal broadly edged with black; tail not white-edged; pectoral pale, the dorsal beginning above its middle .... *riukiuanus*. 11.

ee. Mouth moderate, the maxillary not extending beyond pupil; pores before vent about 40; trunk very short, containing head 1⅓ times; lower jaw short; mouth small, the maxillary to below middle of eye, 3 in head .. *nystromi*. 12.

ee. Dorsal and anal pale, the posterior portion for about the length of the head, jet black; pores of lateral line, wide set, about 30 before vent; pores minute; mouth small; pectorals pale .... *retrotinctus*. 13.

7. LEPTOCEPHALUS MYRIASTER (Brevoort).

MAANAGO, TRUE CONGER.

Anguilla myriaster Brevoort, U. S. Expd. Japan, 1856, p. 282, pl. xi, fig. 2, from a rough but characteristic drawing made at Hakodate.

Leptocephalus myriaster Jordan and Snyder, Proc. U. S. Nat. Mus., 1900, XXIII, p. 347, Tokyo, Hakodate.

Conger vulgaris Ishikawa, Prel. Cat. Fish., 1897, p. 7, Hakodate, Tokyo.

Head, $1\frac{9}{10}$ in trunk ($1\frac{3}{5}$ in young); head and trunk, $1\frac{2}{3}$ in tail ($1\frac{3}{5}$ in young); lower jaw included; snout blunt, 4 in head; eye, 2 in snout, rather small; mouth moderate, the maxillary $2\frac{1}{5}$ in head, reaching posterior part of pupil; pectoral rounded, $2\frac{2}{5}$ in head, the dorsal inserted over its last third or fourth, dorsal and anal rather high.

Color dusky brown, paler below; a row of round whitish spots along side of back, regularly placed, beginning with a median spot at the nape, these spots found in no other species; lateral line very distinct, of a row of close-set white pores, just below the lateral line itself, about 38 of these before the vent; a cross series of 16 to 24 whitish pores on nape, just before the median spot; four series of small pores running forward from this; numerous stellate pores, regularly arranged about eye, on snout and on opercle; dorsal and anal each with a broad black median band meeting around the tail; pectoral more or less dusky in adult, pale in the young.

Description from a specimen 23 inches long from Hakodate. Others from Hiroshima, Tokyo, Onomichi, Nagasaki, and elsewhere agree in essential respects, the pores on the head indistinct in those under 6 inches in length.

Coasts of Japan, very abundant; obtained by us at Mororan, Matsushima, Same, Hakodate, Tokyo, Misaki, Hiroshima, Wakanoura, Kobe, Onomichi, Hakata, and Nagasaki. It reaches a length of 2 to 4 feet and is much used as food: (μυρίος, myriad; ἀστήρ, star, from the stellate spots, which at once separate this species from other congers).

8. LEPTOCEPHALUS EREBENNUS Jordan and Snyder, new species.

DAINANANAGO (FORMOSA CONGER); KANAKIUIANAGO (CRAB-EATING CONGER).

? *Conger vulgaris* Schlegel, Fauna Japonica, 1847, p. 259, Nagasaki; not of European waters.

Head, $1\frac{1}{2}$ in trunk; head and trunk, $1\frac{1}{2}$ in tail; lower jaw not very short; snout moderate, 4 in head; eye, $1\frac{3}{4}$ in snout; mouth rather large, the maxillary $2\frac{3}{4}$ in head, extending to opposite posterior border of pupil; pectoral rounded, 3 in head; dorsal inserted over its tip; distance from gill opening to front of dorsal, $2\frac{3}{5}$ in head, dorsal and anal high.

Color almost black, the sides marbled, the belly mottled dusky;

dorsal and anal blackish, with a jet-black margin; lateral line blackish. with a row of whitish dots, like pin pricks, its whole length; about 38 before vent; cross-series of pores on nape not evident; pectoral dusky with a whitish edge behind and below; no white spots on back; no white on tail.

Described from a specimen 19½ inches long, obtained at Misaki. Type No. 6466, Leland Stanford Junior University Museum.

We refer to this species a large specimen also from Misaki, having the dorsal inserted farther backward. Head, 1⅙ in trunk; head and trunk, 1¾ in tail; cleft of mouth extending to just beyond pupil, 2⅛ in head; snout, 3⅚ in head; eye, 1¾ in snout; pectoral, 3 in head, the dorsal beginning well behind its tip; distance from front of dorsal to gill opening, 1⅔ in head.

Color black; fins all blackish, the dorsal and anal broadly edged with black.

Another specimen 2 feet 7 inches long, from Misaki.

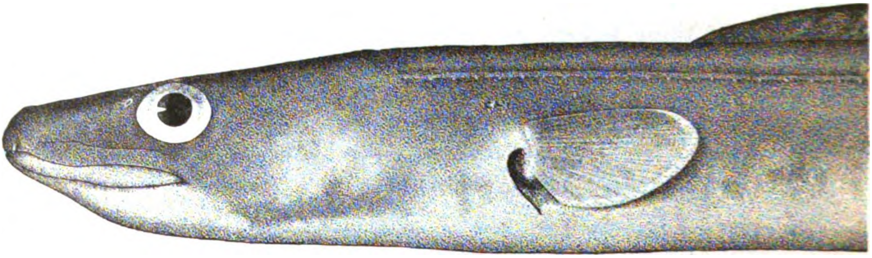

FIG. 3.—LEPTOCEPHALUS EREBENNUS.

Still another specimen, doubtless of the same species, differs equally in measurements:

Head 1⅔ in trunk; head and trunk 1¾ in tail; lower jaw not much shortened; snout rather sharp, 4¼ in head; eye 1⅔ in snout; mouth rather large. the maxillary 2½ in head, extending nearly to opposite posterior border of eye; pectoral pointed, 3⅕ in head; dorsal inserted very slightly behind its tip; distance from gill opening to front of dorsal 1¾ in head; dorsal and anal moderate.

Color very dark, almost black; lateral line, a continuous streak, with minute, whitish, wide-set pores, like pin pricks, about 45 before vent; no pale spots; cross series of pores on back of head very minute; pectorals black, with a pale edge below; dorsal and anal dusky, with a broad black margin; no white on tail.

This specimen, taken at Misaki, is 14 inches long. This species is known to fishermen as *Kanakiuianago* or *Dainananago*. It is nearest *Leptocephalus conger*, the common Conger eel of the Atlantic, but differs in some regards. In *Leptocephalus conger* (specimen 1880, Stanford Museum, from Beaufort, North Carolina) there is a distinct cross streak of fine pale pores across occiput; there are 42 pores before vent;

the maxillary is 3 in head; head and trunk 1⅜ in tail; dorsal and anal pale at base, with broad black margin; lateral line with the pores pale, the line itself a pale streak; dorsal inserted over tip of pectoral. We have found in Japan no Conger corresponding to the Atlantic species, though this one comes nearest it. (ἐρεβεννός, very black—as Erebus.)

We refer with some doubt to this species, a small eel, 5 inches long, from Wakanoura. Head 1⅜ in trunk; head and trunk 1⅜ in tail; maxillary extending to posterior border of eye, 2½ in head; snout 3⅜ in head; lower jaw not much shorter; pectoral 2½ in head; dorsal inserted over posterior third of pectoral; 42 pores before vent; lateral line forming a continuous streak. Color light olive; pores of lateral line large, pale, but without white dots; sides with some black dots; dorsal with the black margin obsolete except posteriorly where it is narrow; anal showing traces of a dark edge posteriorly; tip of tail white; pectorals pale; pores on top of head not evident.

9. LEPTOCEPHALUS KIUSIUANUS Jordan and Snyder, new species.

KUROANAGO (BLACK CONGER).

Head 1⅙ in trunk; head and trunk 1½ in tail; lower jaw rather short; snout shortish, 4¼ in head; eye 1¾ in snout; cleft of mouth moderate, the maxillary 3 in head, extending to posterior margin of eye; pectoral pointed, 3¼ in head; dorsal inserted over end of second third of pectoral; insertion of dorsal to gill opening, 4¼ in head; dorsal and anal rather high.

Color dark brown, the dorsal and anal broadly edged with black; tip of tail with a slight white margin. Pectoral dusky, with a pale edge. Lateral line conspicuous, with small pale pores, 38 before vent; no white spots anywhere. Pores on head inconspicuous.

One specimen, type No. 6467, Leland Stanford Junior University Museum, 2½ feet long, from Hakata, province of Chikuzen, in Kiusiu. It differs strongly from any other species we have seen in the relative shortness of the trunk. The dorsal is inserted anteriorly, but not so far forward as in *L. nystromi*, which has also the trunk short. *Leptocephalus marginatus* (=*noordziecki*, Bleeker) from Polynesia, has higher fins and slenderer body.

10. LEPTOCEPHALUS JAPONICUS[1] Bleeker.

Conger japonicus BLEEKER, Enum. Espèce Ic. Poiss. Japon, 1874, p. 32, Japan.

This species, according to Bleeker, is characterized by its dentition, its convex anterior profile, by the relative length of its head and trunk, by the length of its pectorals, and the size of its gill openings. Maxillary reaching to opposite posterior part of pupil; head 2⅗ in trunk; 8 in total length; head and trunk 1⅗ in tail (from figure); pectorals 2½ in head, reaching past front of dorsal; gill openings broader than base of pectoral.

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[1] **LEPTOCEPHALUS HETEROGNATHUS (Bleeker.)**

Closely allied to this genus is a young Conger in very bad condition received by Dr. Bleeker from Nagasaki. According to Günther, the typical example belongs to *Congermuræna* and is very closely allied to the New Zealand species, *C. habenata*, having a similar dentition (like that of *Congrellus*, except that the teeth are blunt).

Color mottled dusky above, paler below; fins yellowish, the black margin of dorsal obsolete (on the figure); pectorals pale. (Bleeker.)

One specimen 336mm. long, said to be from Japan, apparently distinguished by its pale dorsal fins and anal. Not seen by us.

This species is also very close to the one figured by Bleeker from East Indian examples as the true Conger (*Leptocephalus conger* = *Conger vulgaris*), but the young examples have the tail shorter than in Bleeker's figure, doubtless a matter of age. The European Conger seems, however, to be different from any Japanese Conger we have seen. It is possible that further research will show that *japonicus* is the young and *erebennus* the adult of the same species.

11. LEPTOCEPHALUS RIUKIUANUS Jordan and Snyder, new species.

Head 2 in trunk; head and trunk together half length of tail; mouth larger than in related species, the jaws subequal, the maxillary 2½ in head, extending to opposite posterior margin of eye; snout rather pointed, 4¼ in head; eye large, 1½ in snout, about 6½ in head; pectorals 3¼ in head; dorsal inserted about over middle of pectoral.

Color dusky above, paler below; a series of small faint white pores along the lateral line, these smaller, farther apart, and less distant than in *Leptocephalus myriaster*, and becoming obsolete behind; about 36 of these before the vent; dorsal and anal each with a broad black margin which surrounds the tip of the tail, pectoral pale; a dark streak through snout, extending obliquely downward and backward below eye; nuchal pores small, few in a cross series.

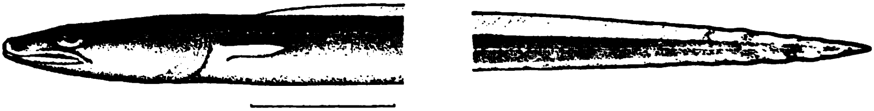

FIG. 4.—LEPTOCEPHALUS RIUKIUANUS.

It may, perhaps, "be recognized by the great length of its tail; body = 2 inches; tail, 3½ inches," which is about the usual relation in *Leptocephalus*.

The species was not seen by us. There is nothing in the published account to separate it from a young *Leptocephalus*, for example, *L. japonicus*, which has little dark edging to its dorsal. (ἕτερος, different; γνάθος, jaw.)

Myrophis heterognathus BLEEKER, Act. Soc. Sci. Indo-Nedrl. V, Japan, p. 9, pl. III, fig. 1, Nagasaki.

Gnathophis heterognathus KAUP, Aale Hamburg. Mus., 1859, p. 7 (after Bleeker).

(*Congermuræna*) *heterognathus* GÜNTHER, Cat. Fish., VIII, 1870, p. 42, same specimen.

One specimen 13½ inches long. Type No. 6468, Leland Stanford Junior University Museum, obtained by Capt. Alan Owston at Yaeyama, Ishigaki Islands, in the southern Riukiu group. This species is near to *L. erebennus*, but has the backward insertion of the dorsal characteric of *L. nystromi*. It is, however, clearly distinct from *L. nystromi*, and equally different from *L. myriaster*.

12. LEPTOCEPHALUS NYSTROMI Jordan and Snyder, new species.

Conger marginatus GÜNTHER, Shore Fishes, Challenger, 1880, p. 73, Inland Sea of Japan.—NYSTROM, Kong. Sven. Vet. Ak., XIII, 1887, p. 47, Nagasaki; not of Valenciennes.—ISHIKAWA, Prel. Cat. 1897, p. 7, Riukiu Islands.

Head 1⅓ in trunk; head and trunk 1⅔ in tail; mouth small, the maxillary extending about to middle of eye, 3 in head; lower jaw much shorter than upper; snout blunt, somewhat cavernous, 3½ in head; eye 1½ in snout, smaller in adult; pectorals 3 in head; dorsal inserted over middle of pectoral or a little before; distance from gill opening to dorsal, 8 in head; dorsal and anal not especially elevated.

Color very pale, brownish above, whitish below; dorsal and anal with a broad black margin surrounding the tail; pectoral pale or slightly dusky at base; lateral line a conspicuous ridge with about 35 pores before vent; these a little paler than body; nuchal pores not evident.

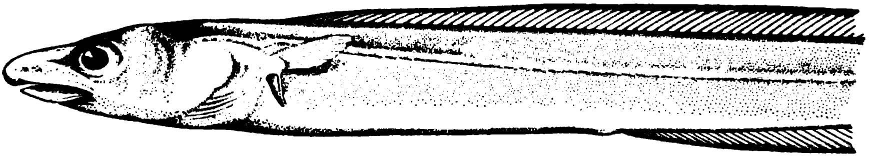

FIG. 5.—LEPTOCEPHALUS NYSTROMI.

Southern Japan, north to Kobe, here described from the type, No. 6469, Leland Stanford Junior University Museum, taken at Nagasaki. The species has been confounded with *L. marginatus* of Polynesia, with which it agrees in the insertion of the dorsal. *L. marginatus* has the pectoral black at tip and the dorsal fin higher. (Named for Edward Nystrom, of the University of Upsala, in recognition of his excellent work on the fishes of Nagasaki.)

13. LEPTOCEPHALUS RETROTINCTUS Jordan and Snyder, new species.

Head 1¾ in trunk; head and trunk 1⅘ in tail; lower jaw short; snout rather blunt, 4 in head; eye 1½ in snout; mouth small, the maxillary extending to opposite posterior part of eye, 2⅔ in head; pectoral pointed, 3⅓ in head; the dorsal inserted rather in front of its middle; distance from gill opening to dorsal about 8 in head; dorsal and anal rather low. Lateral line a broad furrow with a ridge, no conspicuous pale pores or pin pricks, the pores wide set and indistinct, about 30 before vent; cross series of pores at nape, very minute, scarcely visible. Color very pale brown, somewhat silvery, the sides abruptly paler; pectoral pale; dorsal and anal pale except for a distance from tip of tail about equal to length of head, in which both fins are entirely black; tip of tail black, edged with pale in one specimen.

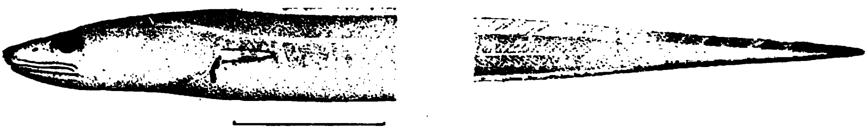

FIG. 6.—LEPTOCEPHALUS RETROTINCTUS.

Two specimens, each 11 to 12 inches long, found in the market at Tokyo. Type No. 6470, Leland Stanford Junior University museum. The peculiar coloration of the dorsal and anal furnishes a distinctive character, as also the character of the lateral line. (*Retro-*, behind; *tinctus*, dyed.)

6. CONGRELLUS Ogilby.

Congrellus OGILBY, in Jordan and Evermann, Fishes N. M. America, III, 1898, p. 2801 (*balearica*).

Dorsal fin inserted more anteriorly than in *Leptocephalus*, over the gill opening or anterior part of pectoral; head with muciferous cavities, more or less conspicuous; mouth rather small; teeth all pointed; body more robust than in *Leptocephalus*, the tail not much if any longer than rest of body, its tip white in Japanese species; dorsal and anal edged with black. The genus is not very different from *Leptocephalus*, the species *megastomus* being almost exactly intermediate. (Diminutive of *Conger*, the Conger eel.

a. Mouth large, the maxillary extending much beyond pupil; 2⅓ in head; pectorals 3⅓ in head; nape with a distinct cross series of about 4 pores; dorsal and anal without dark margin; end of tail black, with a broad pale border; pectorals dusky .... *megastomus*. 14.

aa. Mouth moderate, the maxillary extending to opposite posterior part of pupil; about 3½ in head; dorsal and anal each with a broad black margin; tip of tail white; pectorals pale (*anago*) or dark (*meeki*) .... *anago*. 15.

14. CONGRELLUS MEGASTOMUS (Günther).

OKIANAGO; OFF SHORE CONGER.

Congromurana megastoma GÜNTHER, Shore Fishes Challenger, 1880, p. 73, Enoshima, from Japanese fishing boats, specimens 11 to 19 inches long.

Head 2 in trunk; head and trunk 2⅖ in total; 1⅖ in tail; snout rather short and blunt, 3¾ in head; lower jaw shorter than upper; eye 1⅓ in snout; mouth small, the maxillary 2⅓ in head, extending to opposite posterior part of eye; pectoral, short, rounded, 3⅓ in head; dorsal inserted a little before middle of pectoral; dorsal and anal moderate. Color pale olivaceous; a series of minute whitish pores along lateral line, much smaller and less distinct than in *Leptocephalus myriaster*, 47 of them in front of vent; a few similar but larger pores on head, about 4 arranged in cross-series on the nape, these less numerous than in *L. myriaster;* snout with large pores; no pale dots above lateral line; pectoral largely blackish; dorsal and anal without black margin; tip of tail with dorsal and anal fins for a space about two-fifths length of head abruptly black, with a broad white margin.

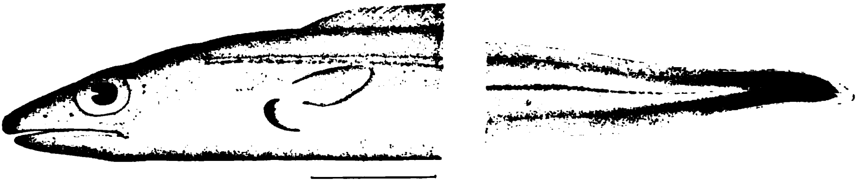

FIG. 7.—CONGRELLUS MEGASTOMUS.

Shores of Japan in rather deep water. Known from Sagami and Totomi bays. Here described from two examples, each about a foot long; the one, dredged by the U. S. Fish Commission Steamer *Albatross* off Hamamatsu (Totomi) in 34 fathoms, station 3730; the other, taken with a long line (dabonawa) off Misaki, by Kumakichi Aoki, and presented to us by Professor Mitsukuri. The peculiar coloration of the tail at once separates it from the other Congers. In its technical characters it is almost as near *Leptocephalus* as *Congrellus*. (μέγας large; στόμα, mouth.)

15. CONGRELLUS ANAGO (Schlegel).

ANAGO.

Conger anago SCHLEGEL, Fauna Japonica, 1846, p. 259, pl. CXIII, fig. 1, Nagasaki.—BLEEKER, Verh. Bat. Gen. Japan, p. 52.

Congromuræna anago GÜNTHER, Cat. Fish., VIII, 1870, p. 42, Japan, Amboyna.—GÜNTHER, Shore Fish. Challenger, 1880, p. 73, Yokohama.—ISHIKAWA, Prel. Cat., 1897, p. 6, Tokyo.

? ? *Ophisoma anagoides* BLEEKER, Atl. Mur., p. 27, Singapore, Celebes, Batjan, Amboyna, Banda (distinguished from *C. anago* by the smaller eye, stouter form, smaller head, and narrower border of the fins, the anal and tip of tail without black; probably a different species).

Congrellus meeki, JORDAN and SNYDER, Proc. U. S. Nat. Mus., XXIII, 1900, p. 347, pl. XI, Tokyo, based on a large example with black pectoral; several such examples were taken by us in Tokyo Bay and at Wakanoura. Except for the dark color of the pectorals no difference can be detected. The insertion of the dorsal is subject to considerable variation.

Head $1\frac{4}{5}$ in trunk; head and trunk $1\frac{1}{10}$ to $1\frac{1}{20}$ in total; form robust; snout short, bluntish, 5 in head; eye very large, about as long as snout; cleft of mouth reaching about to posterior part of pupil, $3\frac{3}{5}$ in head. Teeth less closely set than in *Leptocephalus*, all pointed.

Pectoral 2⅘ in head, the dorsal beginning variously from above its base to nearly over its middle. Sixty pores before the vent, the pores smaller than in *Leptocephalus*.

Body light or dark brownish, the head sometimes dotted; usually two dark shades behind eyes; pores of lateral line inconspicuous; cross-series of pores on nape not evident; pectoral fin pale or variously blackish (*meeki*), sometimes entirely black, usually pale, especially in the young; tip of tail always white; vertical fins with a broad black margin. Length 1 to 2 feet.

Coasts of Japan and southward, very common and much used as food. It varies somewhat in color. Our specimens from Tokyo, Misaki, Kobe, Wakanoura, and Nagasaki. Several large specimens from Tokio and Wakanoura have the pectorals black and correspond to *Congrellus meeki*, but no other distinctive characters can be made out. *Congrellus meeki* is probably only a highly colored adult. (*Anago*, the Japanese name; possibly from *ana*, hole; *go*, child or creature.)

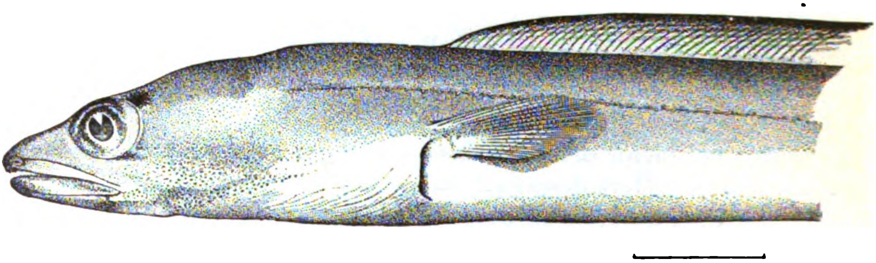

FIG. 8.—CONGRELLUS ANAGO.

Family V. MURÆNESOCIDÆ.

Scaleless anguilloid eels, with the posterior nostril not labial, the tongue largely adnate, the jaws not excessively elongate, the tail of moderate length, the end of the tail surrounded by the caudal fin, and the pectoral fins well developed; gill openings rather wide; jaws of moderate length; vomer well armed. None of these characters appear to have in themselves great importance, but, according to Dr. Gill, in the genus *Murænesox*, the only genus in which the osteology is well known, the characters are such as fully to justify family distinction. Dr. Gill gives the following diagnosis of Murænesocidæ:

> Enchelycephalous Apodals with the tongue not free, the branchiostegal membrane connecting the opposite sides below, the epipharyngeals reduced to one pair, and the hypopharyngeals linguiform and encroaching on the fourth branchial arch.

The species of this family are not very numerous, and a large proportion are American. In general appearance and habits they approach the Congers. All are plainly colored and some descend to rather deep water.

a. Teeth in jaws in several series, those of one series enlarged and compressed, long canines in front; vomer with several long series of teeth, the middle one of very large canines; snout moderate; dorsal beginning above gill opening. *Murænesox*. 7.

aa. Teeth in the jaws in three series, those of the median series containing long, wide-set canines; vomer with very small teeth; pectoral and vertical fins well developed, the dorsal inserted over the gill opening; snout very long, pointed; tail shorter than rest of body .... *Oxyconger*. 8.

7. MURÆNESOX McClelland.

Murænesox McClelland, Calcutta Journ. Nat. Hist., IV, 1843, p. 408 (*tricuspidata*).
Cynoponticus Costa, Fauna Napoli, Pesci., 1850, pl. XXVIII (*ferox* = *savanna*).
Brachyconger Bleeker, Nederl. Tidsskr., Dierkunde, II, 1865, p. 236 (*savanna*).
Congresox Gill, Proc. U. S. Nat. Mus., 1890, p. 234 (*talabon*).

Body robust. Dorsal and anal fins well developed, the dorsal beginning nearly above gill opening. Mouth large; teeth in jaws in several series, those of one series enlarged and depressed, forming long canines in front; vomer with several long series of teeth, the middle one of strong canines. This genus contains numerous species of large, conger-like eels, some of which are found in all warm seas. They are remarkable for the strong armature of the vomer. (*Muræna*; *Esox*, pike.)

16. MURÆNESOX CINEREUS (Forskål).

HAMO.

Muræna cinerea or *tota cinerea* Forskål, Descr. Anim., 1775, pp. X, 22, Red Sea.

Murænesox cinereus Günther, Cat. Fish., VIII, 1870, p. 46, Vizagapatam, Calcutta, Philippines, Singapore, Amoy, Formosa, Japan, Australia.—Nystrom, K. Svensk. Vet. Akad. Handl., 1877, p. 46, Nagasaki.

Muræna arabica Schneider, Syst. Ichth., 1801, p. 488, after Forskål.

Muræna bagio Hamilton-Buchanan, Fish Ganges, XXIV, 1822, p. 364; Ganges River.

Murænesox bagio Peters, Wiegm. Archiv., 1855, p. 270.—Kaup, Apodes, 1856, p. 116, pl. XIV, fig. 73.—Bleeker, Atlas. Ichth, Muræn., p. 24, pl. XXVI, fig. 2, Java, Pinang, Bintang, Singapore, Sumatra, Borneo, Celebes, Philippines.

Ophisurus rostratus Quoy and Gaimard, Voy. Uranie, 1846, p. 242, pl. LI, fig. 1.

Conger longirostris Bennett, Life of Raffles, 1830, p. 692.

Conger oxyrhynchus Eydoux and Souleyet, Voyage Bonite, I, p. 203, pl. IX, fig. 2.

Murænesox tricuspidata McClelland, Journ. Nat. Hist., IV, 1844, p. 409, pl. XIV, fig. 1, 1844, River Ganges.

Congrus tricuspidatus Richardson, Voy. Sulphur, Fish., 1846, p. 105, pl. LI, fig. 2, and elsewhere.

Murænesox hamiltoni McClelland, Journ. Nat. Hist., V, 1844, pp. 182, 210, pl. VIII, fig. 3, River Ganges.

Murænesox bengalensis McClelland, Journ. Nat. Hist., V, 1844, pp. 182, 210.

Conger hamo Schlegel, Fauna Japonica, Poiss, 1846, p. 262, pl. CXIV, fig. 2, Nagasaki.—Brevoort, Exped. Japan, p. 282, 1856, Shimoda.

Congrus protervus Richardson, Voy. Erebus and Terror, Fish., 1846, p. 110.

Congrus angustidens Richardson, Voy. Erebus and Terror, Fish., 1846, p. 110; China.

Congrus brevicuspis Richardson, Voy. Erebus and Terror, Fish., 1846, p. 110; locality unknown.

Congers singapurensis Bleeker, Verh. Bat. Gen. Mur., XXV, p. 21, Singapore.

Murænesox singapurensis Bleeker, Atlas Ichth. Mur., p. 25, pl. VII, fig. 2.

Snout long, rather pointed; vomerine teeth compressed, with a basal lobe in front and behind; teeth in the inner series of mandible similar to those on the vomer, but smaller and rarely with basal lobes; teeth of the outer series rudimentary, not bent outward. Dorsal inserted close behind base of pectoral. Ashy-gray, sides silvery; dorsal and anal with a broad black margin; pectorals pale, or suffused with dusky on the under side.

Length 4 to 6 feet. A very large eel, with very strong teeth, widely distributed in the East Indies and north to Japan. We follow Dr. Günther in identifying the Japanese *hamo*, with *M. cinereus*, of the Red Sea, finding no grounds on which to suspect difference. Our numerous specimens are from Tokyo, Misaki, Tsuruga, Wakanoura, Onomichi, Hiroshima, and Nagasaki. It is much used as food and known by the name of *hamo* (*Cinereus*, ashy).

8. OXYCONGER Bleeker.

Oxyconger BLEEKER, Atlas, Ichth. Muraen. 1867, p. 19 (*leptognathus*).

Body compressed; snout much produced; teeth in each jaw in about three series; the median series containing long, slender canines, wide-set, some of them straight, some of them curved; vomer with series of very small teeth. Pectorals slender, well developed. Dorsal inserted over gill opening. Nostrils without tubes, the posterior in front of the eye, at some distance from it. Japan. (ὀξύς, sharp; *Conger*.)

17. OXYCONGER LEPTOGNATHUS Bleeker.

Conger leptognathus BLEEKER, Act. Soc. Indo-Nedrl., III; Japan, IV, p. 27, Nagasaki.

Oxyconger leptognathus GÜNTHER, Cat. Fishes, VIII, p. 49, 1870; same specimen.

Head $2\frac{1}{10}$ in trunk; tail shorter than rest of body, about one-fifth longer than trunk; cleft of mouth $1\frac{3}{5}$ in head; about 12 canines on each side in each jaw; snout very sharp, $2\frac{1}{6}$ in head; eye $3\frac{3}{4}$ in snout; pectoral $4\frac{1}{2}$ in head. Olivaceous, sides silvery, dorsal and anal each with a broad black margin; pectoral pale; tip of tail white with a black edging. Coasts of Japan, two specimens known, the original

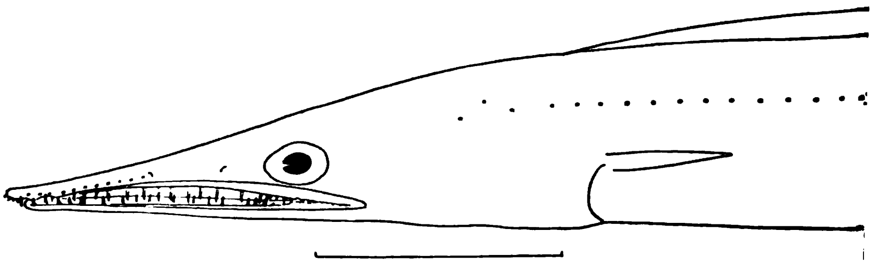

FIG. 9.—OXYCONGER LEPTOGNATHUS.

type from Nagasaki; the second, here described, about 14 inches long, from the market of Tokyo, taken outside of Tokyo Bay, off Awa or Misaki. (λεπτός, slender; γνάθος, jaw.)

Family VI. NETTASTOMIDÆ.

Eels without pectoral fins, the tongue not free, the posterior nostril before the eye, the gill openings small, separate, subinferior, the vent remote from the head, the tail ending in a slender tip, the vertical fins moderately developed; and the jaws produced, slender and straight, the upper the longer, both as well as the vomer armed with bands of close-set slender teeth. The species are allied to the *Murænesocidæ*, but are weaker fishes, of the deep sea, with fragile bodies, the skin sometimes charged with black pigment.

a. Nostrils valvular on the upper surface of the head; the posterior above anterior angle of eye; tail tapering to a point; snout without fleshy projection at tip. *Nettastoma.* 9

aa. Nostrils lateral, the posterior slit-like, in front of eye .... *Chlopsis.* 10

9. NETTASTOMA Rafinesque.

Nettastoma RAFINESQUE, Caratteri, etc., 1810 (*melanurum*).

Characters of the genus included above. (νῆττα, duck; στόμα, mouth.)

18. NETTASTOMA PARVICEPS Günther.

Nettastoma parviceps GÜNTHER, Ann. Mag. Nat. Hist., XX, 1887, p. 446, south of Yedo (Tokyo); Rept. Challenger Fishes, 1887, p. 253, pl. LXIII, fig. A, same specimen.

Head small, its length 2½ in distance from gill-opening to vent. Dorsal fin inserted in advance of gill-opening. In other respects similar to *Nettastoma melanurum* of the Mediterranean. (Günther.) The figure shows a row of 5 or 6 large pores across occiput; snout 2⅖ in head; head and trunk shorter than tail, which ends in a slender point; 45 pores in lateral line before vent; cleft of mouth a little more than half head, extending to just beyond eye; eye 4 in head. Color not very dark, apparently some edging to the fins behind.

One specimen known, taken by the *Challenger* south of Tokyo at station 232, in 345 fathoms; length, 26½ inches; not seen by us. (*Parvus*, small; *ceps*, head.)

10. CHLOPSIS Rafinesque.

Chlopsis RAFINESQUE, Indice Ittiol. Sicil., 1810, p. 58 (*bicolor*.)
Saurenchelys PETERS, Berliner Monatsber., 1864, p. 397 (*cancrivora-bicolor*.)

This genus sufficiently characterized above differs from *Nettastoma* in the position of the nostrils, the posterior being in front of the eye, as usual in congroid fishes. Deep water. (χλόη, twig; ὄψις, appearance.)

19. CHLOPSIS FIERASFER Jordan and Snyder, new species.

Head 1⅙ in trunk; head and trunk $2\frac{9}{10}$ in tail; snout produced, with a slight fleshy tip, 2½ in head; eye 3⅗ in snout; cleft of mouth extending to posterior edge of pupil; teeth sharp, slender, rather close-set; dorsal inserted behind gill-opening at a distance a little greater than length of eye; a mucous tube, behind occiput across neck, without distinct pores; lateral line a continuous tube, with 29 large slit-like pores before vent. Depth of body 4⅓ in head, tail tapering to a moderate point, without filament at tip. Color light olivaceous, with silvery sheen on sides of head; posterior part of dorsal and anal in the type for a distance about two-thirds length of head jet black as though dipped in ink; rest of fins pale; another specimen without black on tail; a black dot at base of each dorsal and anal ray, that on anal sending a narrow streak up each ray.

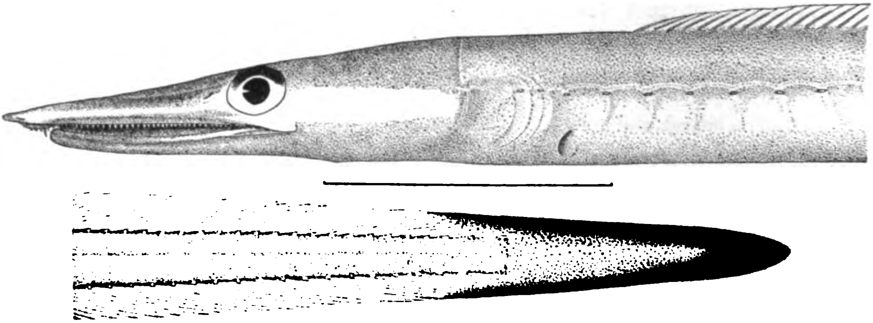

FIG. 10.—CHLOPSIS FIERASFER.

Two specimens, the type 18½ inches long, No. 6471, Stanford University Museum, taken at Wakanoura, in Kii, Japan; a female with ripe eggs; the other 14½ inches long (No. 49728, U. S. Nat. Mus.), taken also at Wakanoura. The two specimens differ a little, especially in the color of the tail, but are evidently not of distinct species. The snout of the smaller one measures 2⅔ in head. (*Fierasfer*, a fish of similar color; from φιερός, sleek.)

Family VII. MYRIDÆ.

End of tail surrounded by the confluent vertical fins; the posterior nostril is in, or very near, the upper lip; the teeth small, and the tongue is more or less fully adnate to the floor of the mouth. The species are usually of small size and plain colors, more or less worm-like in form, and inhabit sandy coasts in tropical seas. They are intermediate in character between the *Ophichthyidæ* and the *Muraenesocidæ*. The osteology has not yet been carefully studied, but they will probably be found to be most nearly related to the latter family. Indeed, the

Muraenesocidæ, *Nettastomidæ*, and *Myridæ* are all very close to the *Leptocephalidæ* and might be reunited with the latter, as in Bleeker's arrangement.

a. Pectorals present; dorsal beginning near the gill opening.............*Myrus*. 11.
aa. Pectorals wanting; dorsal low, beginning well behind gill opening.
Murænichthys. 12.

11. MYRUS Kaup.

Myrus Kaup, Apodes, 1856, p. 31 (*myrus*).

Body slender; nostrils close to margin of upper lip, the anterior tubular, the posterior lobed. Pectoral well developed; dorsal beginning behind gill opening; caudal rays very short. Teeth subequal in bands. Species few, of the Mediterranean Sea and Japan. (μῦρος, an ancient name in Aristotle of some eel.)

20. MYRUS UROPTERUS (Schlegel).

Conger uropterus Schlegel, Fauna Japonica, Poiss., 1847, p. 261, Nagasaki.

Ophisurus uropterus Bleeker, Act. Soc. Nederl., III; Japan, IV, p. 28; V, pl. I, fig. 1, Nagasaki.

Myrus uropterus Günther, Cat. Fish., VIII, 1870, p. 50, from a specimen sent by Dr. Bleeker.—Nystrom, K. Svensk. Vet. Akad. Handl., 1887, p. 46. Nagasaki.

Tail twice as long as trunk without head; cleft of mouth to hind margin of eye; dorsal fin beginning over end of pectoral; front margin of eye much nearer end of maxillary than tip of snout. Coloration plain brownish. (Günther.) Nagasaki; not seen by us; probably rare. (φυρά, tail; πτερόν, fin.)

12. MURÆNICHTHYS Bleeker.

Murænichthys Bleeker, Verhand. Batavia, Gen. Muræn., XXV, 1853, p. 71 (*gymnopterus*).

Slender worm-shaped eels, without pectoral fins, and with both nostrils on the margin of the upper lip. Dorsal and anal very low, beginning far behind gill opening and meeting around the tail; gill opening small; teeth small. East Indies and Japan. (μύραινα, moray; ἰχθύς; fish.)

a. Dorsal fin inserted before vent.
  b. Dorsal fin inserted more than a head's length before vent, at a point nearer gill opening than vent; form robust, snout blunt, flattish; top of head with large pores, fins well developed on tail..............................*owstoni*. 21.
  bb. Dorsal fin inserted less than a head's length in advance of vent; form slender.
    c. Snout short, blunt, 10 in head, not longer than eye; insertion of dorsal three-tenths of the head's length before vent; head 2⅔ in trunk........*hattæ*. 22.
aa. Dorsal fin inserted behind vent; snout long, sharp, 5½ in head, much longer than eye; insertion of dorsal three-fourths head's length before vent; head 3¾ in trunk...*aoki*. 23.

21. MURAENICHTHYS OWSTONI Jordan and Snyder, new species.

Body moderately robust, cylindrical, the depth 3 in head; head 2⅖ in trunk; head and trunk 1⅗ in tail; eye 2 in snout; snout rather obtuse, flattish above, 5⅛ in head; cleft of mouth 3 in head, extending well beyond eye; teeth mostly biserial; gill opening smaller than eye. Dorsal inserted nearer gill opening than vent at a distance equal to 1⅖ times length of head in front of vent; dorsal and anal well developed on tail, the highest rays two-thirds length of snout, much higher than those on back. Lateral line running high, continuous, about 45 pores before vent, little curved above throat; top of head with about 9 pores regularly arranged.

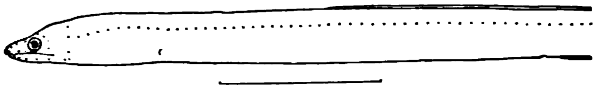

FIG. 11.—MURAENICHTHYS OWSTONI.

Color uniform chestnut brown, darker above and scarcely dotted; belly and fins paler, but of similar shade.

Here described from a specimen, 9 inches long, obtained by Mr. Alan Owston, at Yaeyama Island, one of the Ishigaki group in the southern part of the Riukiu Archipelago in Japan. Type No. 6472, Leland Stanford Junior University Museum; a smaller specimen was taken at the same time.

This species is close to *Muraenichthys macropterus* from Amboyna and Solor, but has stouter body, larger fins, and the dorsal inserted a little farther forward.

Named for Mr. Alan Owston, of Yokohama, a well-known English naturalist and collector, discoverer of the species.

22. MURAENICHTHYS HATTÆ Jordan and Snyder, new species.

Body elongate, subcylindrical, the depth 4 in head; head 2⅙ in trunk; head and trunk 1½ in tail; eye 2 in snout; snout short, blunt, 7⅛ in head; cleft of mouth 4 in head, extending far behind eye; dorsal inserted in front of vent at a distance equal to three-tenths length of head. Lateral line little curved at throat, with 54 pores before vent. Color brownish, with fine dots above; vertical fins dusky behind.

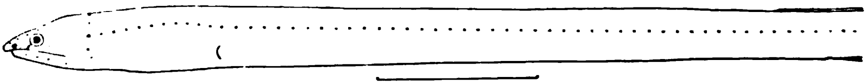

FIG. 12.—MURAENICHTHYS HATTÆ.

One specimen 13 inches long, from a rock pool at Wakanoura, No. 6473, Leland Stanford Junior Museum.

Named for Dr. S. Hatta, of the Imperial University, of Tokyo, in recognition of his excellent paper on the Lampreys of Japan.

23. MURÆNICHTHYS AOKI Jordan and Snyder, new species.

Body elongate, worm-shaped, the depth 4 in head; head 3¾ in trunk; head and trunk 1⅕ in tail; eye 2⅓ in snout; snout rather long and sharp, 5½ in head; cleft of mouth 3⅕ in head, extending somewhat behind eye; dorsal fin rudimentary, inserted behind vent at a distance equal to about 2 times length of snout. Lateral line curved upward over the throat. Color brownish, with dark dots; sides silvery; fins plain.

This species is close to *Murænichthys hattæ*, but has a shorter head, longer, sharper snout, and the dorsal beginning farther forward. The type specimen No. 6474, Stanford University Museum, 7½ inches long, is from a rock-pool at Misaki. It may prove indistinguishable from *M. hattæ*, but the differences seem far too great for the limits of one species.

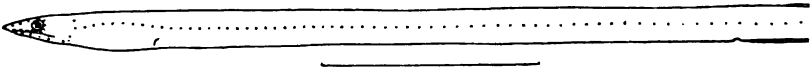

FIG. 13.—MURÆNICHTHYS AOKI.

Named for Kumakichi Aoki, fisherman, assistant to Dr. Mitsukuri in the Marine Laobratory at Misaki, and one of the best collectors in Japan.

Family VIII. OPHICHTHYIDÆ.

SNAKE EELS.

This family includes those true eels which are scaleless, and have the end of the tail projecting beyond the dorsal and anal fins, and without the rudiment of a caudal fin. Anterior nostrils placed in the upper lip, opening downward; gill openings not confluent; tongue more or less fully adnate to the floor of the mouth. The species are, for the most part, moderate or small in size, and they are very abundant in the tropical seas, especially about the coral reefs. The eggs are numerous, of moderate size, similar to those of ordinary fishes. Species numerous, especially in the Tropics. Many of the species are singularly colored, the bands or spots heightening the analogy between them and the serpents.

a. Body without evident fins anywhere except a slight ridge along back; teeth all small, conical; gill openings close together, subinferior, converging forward; anterior nostril tubular; tongue scarcely free in front; mouth small.
Sphagebranchus. 13.

aa. Body with distinct dorsal and anal fins.

b. Pectoral wanting; dorsal high, beginning on nape..............*Callechelys*. 14.

bb. Pectoral present.

c. Vomerine teeth none; teeth pointed..........................*Leiuranus*. 15.

cc. Vomerine teeth present.

d. Teeth blunt, mostly granular or molar; pectoral fins present, small.

e. Dorsal rather high, inserted on the head before gill opening; anal not nearly reaching tip of tail..........................*Chlevastes*. 16.

ee. Dorsal beginning behind gill opening................*Pisoodonophis*. 17.

dd. Teeth all pointed, none of them molar; pectoral fins well developed, much longer than eye; gill openings usually lateral, sometimes subinferior.

f. Snout moderate or short, less than one-fourth head, the jaws not produced into a slender beak.

g. Lips not fringed with conspicuous barbels.

h. Teeth subequal, with no elongate canines on jaws or vomer.

i. Teeth in sides of upper jaw in several series forming broad bands; jaws long; lips without papilla....................*Xyrias*. 18.

ii. Teeth in sides of upper jaw in one or two series.

j. Dorsal fin inserted over gill opening or nearly so; trunk very long..................................*Microdonophis*. 19.

jj. Dorsal fin inserted well behind base of pectoral.............. *Ophichthus*. 20.

hh. Teeth unequal, some of them long canines, either on vomer or on sides of one or both jaws; mouth large, the snout short, and the eyes more or less superior..................*Mystriophis*. 21.

gg. Lips with a conspicuous fringe of barbels; canines present on jaws and vomer; jaws rather long, the lower projecting; head depressed; eyes superior; tail shorter than rest of body..*Brachysomophis*. 22.

ff. Snout long, the jaws produced in a slender beak; canine teeth strong; dorsal fin inserted well behind pectorals.............*Oxystomus*. 23.

13. SPHAGEBRANCHUS Bloch.

Sphagebranchus Bloch, Ichthyologia, LX, 1795, p. 88 (*rostratus*).

Cæcilia Lacépède, Hist. Nat. Poiss., II, 1800, p. 135 (*branderiana* = *cæcus*) (not of Linnæus, a genus of Batrachia).

Apterichthys De la Roche, Ann. Mus., XIII, 1809, p. 325 (*cæcus*).

Branderius Rafinesque, Analyse de la Natur, 1815, p. 93 (substitute for *Cæcilia*).

Very small eels without fins, a slight fold, apparently rayless, representing the dorsal; snout much projecting; teeth small, mostly uniserial; gill openings inferior, converging. Smallest and simplest in structure of the *Ophichthyidæ*, the species little known and scantily represented in collections. (*σφάξ*, throat; *βράγχια*, gills.)

24. SPHAGEBRANCHUS MOSERI Jordan and Snyder, new species.

Eyes well developed; head 5⅚ in trunk; head and trunk 1⅕ in tail; snout sharp, much projecting, its length 5 in head; eye 2 in snout; cleft of mouth 3½ in head; gill slits about as long as eye, converging forward; lateral line distinct from vent backward. A very slight fold along back, indicating the place of the dorsal fin; no evident fin rays. Color, light olive, finely dotted; body with broad, very faint dark shades, scarcely visible, alternate with paler areas; head mottled with darker.

One specimen, 6 inches long, type No. 49728, United States National Museum, dredged by the U. S. Fish Commission steamer *Albatross* at station 3700, in Suruga Bay, off Namazu, in 100 fathoms.

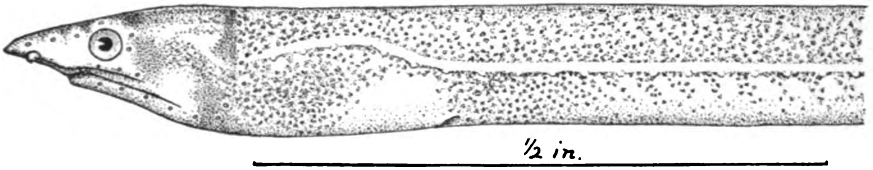

FIG. 14.—SPHAGEBRANCHUS MOSERI.

Named for Jefferson Franklin Moser, lieutenant-commander, U. S. N., in honor of the valued services to ichthyology rendered by him as commander of the U. S. Fish Commission steamer *Albatross*.

14. CALLECHELYS Kaup.

Callechelys KAUP, Apodes, 1856, p. 28 (*guichenoti*).

Pectoral fins wanting; body elongate, compressed; dorsal fin inserted on the head, in advance of the gill opening; tail much shorter than rest of body. Otherwise close to *Ophichthus*. (κάλλος, beauty; ἔγχελυς, eel.)

25. CALLECHELYS MELANOTÆNIA Bleeker.

Callechelys melanotænia BLEEKER, Atlas, Ichthyol. Muræn., 1864, p. 66, pl. XLIX, fig. 2, Amboyna.

Ophichthys melanotænia GÜNTHER, Cat. Fish., VIII, p. 87, Amboyna, same specimen.

Head 11⅔ in trunk; head and trunk 2⅓ times length of tail; body very slender, the depth 2¾ in head; snout pointed, much produced; cleft of mouth narrow, extending behind eye; teeth pointed, uniserial; those in front above, strong, recurved, in two rows; gill openings inferior, slightly convergent. No pectoral fin. Dorsal rather high, beginning above angle of mouth. Color whitish with a broad, well-defined, jet black band along upper part of side, forming about half of depth of body; head whitish, marbled with dusky; dorsal fin white with a broad black edge; anal white.

A very handsome eel, recorded by Dr. Bleeker from Amboyna; a single specimen 19½ inches long collected by Capt. Alan Owston at Yaeyama, Ishigaki Island, Southern Riu Kiu group, and presented to Stanford University. (μέλας, black; ταινία, ribbon.)

15. LEIURANUS Bleeker.

Leiuranus Bleeker, Verh. Bat. Gen. Muræn., XXV, p. 36 (*lacepedii* = *semicinctus*).

Stethopterus Bleeker, Verh. Bat. Gen. Muræn., XXV, p. 36 (*rimineus* = *semicinctus*).

Body cylindrical, mouth small; below the sharp projecting snout; teeth pointed, of moderate size, biserial above, uniserial below; no teeth on vomer; eye small; pectoral small; dorsal and anal low, the former beginning nearly above gill opening.

Small eels, having the bright colors of *Chlevastes*, but in technical respects nearer *Ophichthus*, distinguished by the absence of vomerine teeth. (λεῖος, smooth; οὐρανός, sky, the roof of the mouth.)

26. LEIURANUS SEMICINCTUS (Lay and Bennett).

Ophisurus semicinctus Lay and Bennett, Beechey's Voyage, Blossom, 1839, p. 66, pl. xx, fig. 4. Collected by Mr. Lay, on Oahu; 24 dark cross bands.

Liuranus semicinctus Günther, Cat. Fish., VIII, 1870, p. 54, Fiji, China.

Ophisurus (or *Sphagebranchus*) *rimineus* Richardson, Voy. Sulphur, p. 107, pl. lii, fig. 16–20, China. Coll. Edw. Belcher (young, with 33 dark bands).

Ophisurus rimineus Richardson, Ichth. China, 1846, p. 314.

Stethopterus rimineus Bleeker, Verh. Bat. Gen. Muræn., XXV, p. 36.

Leiuranus lacepedii Bleeker, Verh. Bat. Gen. Muræn., XXV, p. 36.

Leiuranus colubrinus Kaup, Apodes, 1856, p. 2.—Bleeker, Atlas, Ichth. Muraen., p. 42, pl. ix, fig. 1, and of authors (by confusion with *Chlevastes colubrinus*).

Head 6⅔ in trunk; head and trunk one-seventh longer than tail; depth 3½ in head; cleft of mouth short, extending a little beyond eye; dorsal inserted a little posterior to base of pectoral, which is nearly three times the length of the small eye; dorsal and anal extending to near tip of tail. Whitish brown with 24 (24 to 35) broad blackish or dark brown bands, much wider than the interspaces, but growing narrower below, most of them not meeting on the belly anteriorly, those on the tail meeting below more or less perfectly in the large specimen, but not in the two smaller ones. In this regard and in the width of the bands there is considerable variation; first two bands on head, narrow; tip of snout and tip of tail white.

East Indies, not very common. Our three specimens, the largest 17½ inches long, collected at Yaeyama, Ishigaki Islands, in the southern Riu Kiu Archipelago. It was found in company with *Chlevastes colubrinus*, a species to which it bears a remarkable resemblance, the chief difference in color being that the dark cross-bands in *Leiuranus* mostly fail to meet across the belly. If any advantage could be supposed to accrue to either of these harlequins, this would be regarded as a striking case of mimicry. (*Semi*-half; *cinctus*-banded.)

16. CHLEVASTES Jordan and Snyder, new genus.

Chlevastes Jordan and Snyder, new genus (*colubrinus*).

Anal fin ending far before end of dorsal on the tail. Teeth mostly blunt, granular or molar; pectoral fins rudimentary; dorsal beginning before gill opening, on the nape. Colors variegated.

One species in the tropical seas. This genus is very close to *Myrichthys* (= *Ophisurus* Bleeker, not of Lacépède), differing in the disappearance of the anal fin far before the tip of the tail. (χλευαστής, a harlequin.)

27. CHLEVASTES COLUBRINUS (Boddært).

Muræna colubrina Boddært, Pallas, Neue Nord. Beytr., II, 1781, p. 56, pl. ii, fig. 3, Amboyna.

Gymnothorax colubrinus Schneider, Syst. Ichth., 1801, p. 529, copied.

Ophisurus colubrinus Richardson, Voy. Erebus and Terror, Fishes, p. 100.

Opichthys colubrinus Günther, Cat. Fish., VIII, 1870, p. 81, Borneo, Fiji.

Muræna annulata Ahl, De Muræna et Ophichtho, 1789, p. 8, pl. i, fig. 1, East Indies.

Muræna fasciata Ahl, De Muræna et Ophichtho, 1789, p. 9.

Ophisurus fasciatus Lacépède, Hist. Nat. Poiss., IV, 1803, p. 686.—Richardson, Voy. Erebus and Terror, Fishes, p. 100.—Bleeker, Atlas Ichth., Muræn., p. 64, pl. xxi, fig. 1.—Kner, Novara Fische, p. 379.

Pisoodonophis fasciatus Kaup, Apodes, 1856, p. 23.

Ophisurus alternans Quay and Gaimard, Voy. Uranie, I, p. 243, pl. xlv, fig. 2.

Ophisurus fasciatus var. *latifasciatus*, *oculatus*, and *semicinctus* Bleeker, Atlas Ichth., Muræn., p. 64.

Head 7½ in length of trunk; head and trunk 1¼ in tail; depth 2⅔ in head; snout short, pointed, much projecting; cleft of mouth 4 in head, slightly extending beyond eye. Eye very small. Pectoral fin reduced to a slight rudiment; dorsal inserted on top of head, at a point nearer snout than gill opening; dorsal ending not far from tip of tail; end of anal two heads' lengths before tip of tail; teeth small, mostly biserial. Body brownish white, paler below, with 29 jet black rings, about as wide as the interspaces extending on the fins; tip of snout and tip of tail white; rings just as distinct on belly as on back, but with occasional irregularities.

According to Bleeker and Günther, there is also a variety (*fasciatus*) with the interspaces ornamented with ocellate spots, and other varieties are said to differ in the relative length of light and dark rings, the latter occasionally not covering the belly.

East Indies. Our three specimens typical in color, collected by Capt. Alan Owston, at Yaeyama, Ishigaki Islands, southern Riu Kiu. The largest is 16½ inches long.

The close resemblance of this species to *Leiuranus semicinctus* of the same waters has been often noted. (*Coluber*, a spotted snake.)

17. PISOODONOPHIS Kaup.

Pisoodonophis KAUP, Apodal Fishes, 1856, p. 17 (*boro*).
Pisodontophis, amended spelling.

Eels with the blunt teeth of *myrichthys* and the backward dorsal and well-developed pectoral of *Ophichthus*. Species slender, plainly colored, mostly of the East Indies. (πίσος, pea; ὀδούς, tooth; ὄφις, snake.)

28. PISOODONOPHIS ZOPHISTIUS Jordan and Snyder, new species,

Head 3 in trunk; head and body 1⅔ in tail. Body slender cylindrical; its depth 3½ in head. Mouth moderate; its cleft 3⅓ in head; snout sharp 5 in head; eye 9 in head; teeth small, all rounded or granular in narrow bands; pectoral sharp 3⅙ in head; dorsal inserted just before its middle; dorsal fin rather high, distinctly elevated on the black patch in front, low on the tail, which is sharp at tip.

Color blackish above, paler below, with vague pale blotches on side; head with dark lengthwise wrinkles; lower jaw with six black pores on each side and three behind rictus; sides and top of head also with black pores regularly arranged; snout with dark markings; dorsal with a large jet-black blotch in front; the fin posteriorly dusky, with a broad black edge; anal pale, with a blackish edge; pectoral black, narrowly edged with pale.

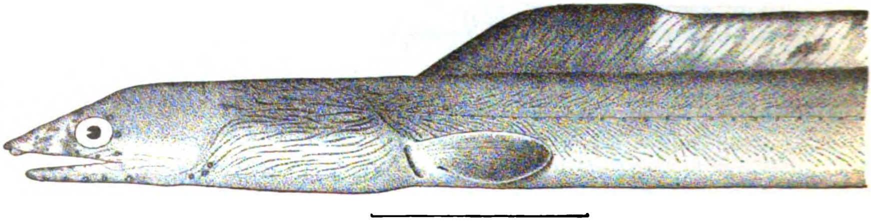

FIG. 15.—PISOODONOPHIS ZOPHISTIUS.

One specimen received from Asakusa Aquarium in Tokyo, taken outside the Bay of Tokyo, near Misaki. Type No. 6475, Leland Stanford Junior University Museum. Its length is 21 inches.

This species is evidently very close to *Pisoodonophis cancrivorus*, as described by Günther, Bleeker, and Richardson. In all the numerous figures of the latter species the pores behind the rictus characteristic of *P. zophistius* are not represented, and none of Bleeker's figures show the black blotch and peculiar form of the anterior part of the dorsal. (ζόφος, dusky; ἱστίον, dorsal.)

18. XYRIAS Jordan and Snyder, new genus.

Xyrias JORDAN and SNYDER, new genus (*revulsus*).

This genus differs from *Ophichthus* in having the lateral teeth in the upper jaw in a broad band of about four series; lower teeth larger, mostly in one row; front teeth somewhat enlarged. From *Cirrhimuraena*, with which it agrees in this regard, it differs in lacking altogether the fringe of fine cirri or barbels along the edge of the upper lip characteristic of the latter genus. The teeth are all pointed, subequal, the pectoral is well developed, and the dorsal fin begins well behind its tip. (*ξυρίας*, a shaveling, from the unfringed lips.)

29. XYRIAS REVULSUS Jordan and Snyder, new species.

Head $3\frac{3}{4}$ in trunk; head and trunk a little longer than tail; depth 4 in head; snout short, $6\frac{2}{3}$ in head; eye $2\frac{1}{2}$ in snout; cleft of mouth very long, extending far behind eye, $2\frac{1}{10}$ in head; teeth in upper jaw in about four rows on each side, equal in size; lower teeth larger, close set, mostly in one row; vomerine teeth moderate; front teeth of upper jaw enlarged; pectoral small, 6 in head; dorsal inserted behind gill opening at a distance $2\frac{2}{3}$ in head.

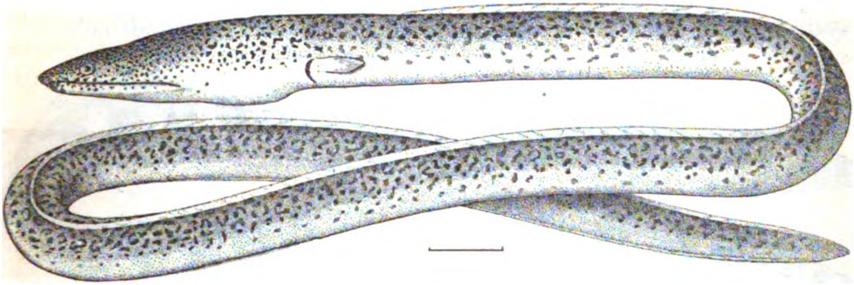

FIG. 16.—XYRIAS REVULSUS.

Color light brown, bluish-white below, upper parts everywhere closely freckled with fine irregular brown spots, rarely confluent and of various forms, rather narrower than the interspaces; these spots darker on head and much more closely set; similar spots on chin; fins all whitish; pectoral a little spotted.

One very fine specimen 35 inches long (No. 6476 Leland Stanford Junior Museum) was obtained at the Asakusa Aquarium, having been taken near Misaki. The species is very distinct from anything else known to us. (*Revulsus*, smooth-shaven, twice plucked; from the smooth lips.)

19. MICRODONOPHIS Kaup.

Microdonophis KAUP, Apodal Fishes, 1856, p. 6, (*altipinnis*).

This genus is distinguished from *Ophichthus* by the anterior insertion of the dorsal, which is placed over the gill opening; pectoral small; trunk very long; teeth pointed, subequal, all uniserial. East Indies. (*μικρός*, small; *ὀδούς*, tooth; *ὄφις*, snake.)

30. **MICRODONOPHIS ERABO** Jordan and Snyder, new species.

MONGAROCHI.

Head 4⅚ to 5 in trunk; head and trunk a little shorter than tail; body rather slender, the depth 2¾ in head; snout blunt, triangular, depressed, 4¾ in head; eye small, 2½ in snout, the front of the eye slightly nearer tip of snout than angle of mouth, the cleft of the mouth extending well beyond eye, 2½ in head; gill opening small; pectoral small, 4¼ in head; teeth subequal, not very sharp, in a single row above and below, the row sometimes somewhat irregular or partly divided into two; vomerine teeth in one row; nasal teeth 3 on each side; no conspicuous pores on head. Dorsal moderate, inserted just a little before gill opening; lateral line conspicuous.

Color brownish olive, white below; body with large, round, brown spots of varying sizes, one large one often alternating with two small ones, the uppermost on the median line; largest spots about one-fifth head; spots on head much smaller, crowded, reducing the pale color to reticulations; lower jaw and throat spotted; pectoral with five or six small spots, these faint in the smaller specimens; dorsal with oblong spots and markings, like those on body; anal plain white.

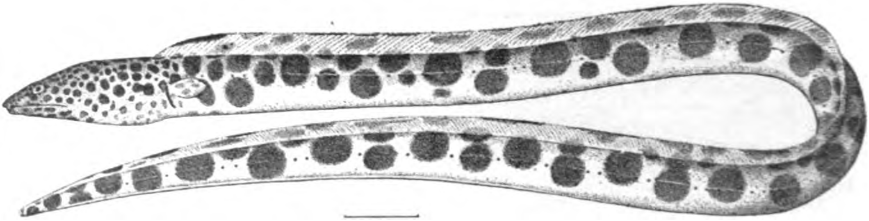

FIG. 17.—MICRODONOPHIS ERABO.

The species is allied to *Ophichthus polyophthalmus* and with it belongs to Kaup's genus or subgenus *Microdonophis*, characterized by the anterior portion of the dorsal and the uniserial teeth.

Three specimens from Misaki, the longest 24 inches in length, type No. 6477, Leland Stanford Junior University Museum, the others 22¼ and 21, received from the Asakusa Aquarium in Tokyo, through the courtesy of Professor Kishinouye, of the Imperial Fisheries Bureau. It is known as *Mongarochi* to the fishermen.

Still another specimen (No. 81, Imperial Museum) was presented to us by Professor Ishikawa. It is from an unknown locality, but we noted its identity with No. 79, in the same list, known to be from Boshu (Awa), at the mouth of Tokyo Bay. Two others, also from an unknown locality, supposably Misaki and No. 4733, Imperial University Museum, were presented by Professor Mitsukuri. Still another, said to be from Okinawa, was received from Yonekichi Komeyama, a dealer in natural history specimens. The spotting of the body and pectoral fins differs considerably in these examples, but all agree in the general coloration, the very long trunk, the forward insertion of the pectorals, and the uniserial teeth. (*Frabo* or *Erabo unagi*, the name of the venomous sea snake, *Platurus fasciatus*, of the bays of South Japan.)

20. OPHICHTHUS Ahl.

Ophichthus AHL, De Muræna et Ophichtho, 1789 (*ophis*).
Ophisurus LACÉPÈDE, Hist. Nat. Poiss., II, 1800, p. 98 (*ophis*).
Congrus RAFINESQUE, Caratteri, etc., 1810, p. 62 (*maculatus*).
Ophisurus SWAINSON, Nat. Hist. Classn. Anim., II, 1839, p. 334 (*pictus-maculatus*). (Not of Lacépède.)
Centrurophis KAUP, Apodes, 1856, p. 2 (*spadiceus*).
Pœcilocephalus KAUP, Apodes, p. 5 (*bonapartei*).
Cæcilophis KAUP, Apodes, p. 6 (*compar*).
Herpetoichthys KAUP, Apodes, p. 7 (*ornatissimus*).
Elapsopsis KAUP, Apodes, p. 9 (*versicolor*).
Muraenopsis KAUP, Apodes, p. 11 (*ocellatus*). (The name wrongly accredited to Le Sueur.)
Scytalophis KAUP, Apodes, p. 13 (*magnioculis*).
Leptorhinophis KAUP, Apodes, p. 14 (*gomesii*).
Cryptopterus KAUP, Aale Hamburg, 1859 (*puncticeps*).
Uranichthys POEY, Repertorio, II, 1867, p. 256 (*havannensis*).
Oxyodontichthys POEY, Anales Soc. Nat. Hist. Esp., 1880, p. 254 (*macrurus*).
Ophichthys BLEEKER, Günther, and of recent authors generally (corrected spelling).

This genus contains all the Ophichthyoid eels which have sharp teeth, no marked canines, well-developed pectoral fins, and the dorsal inserted behind the head. The species are very numerous in tropical seas, and many attempts have been made to split the group into smaller genera. Notwithstanding the great differences when extremes are compared, these small genera can not be well defined. The generic name, *Ophisurus*, often used for other groups, was an exact synonym of *Ophichthus*. (ὄφις, snake; ἰχθύς, fish; hence more correctly written *Ophichthys*.)

a. *Centrurophis* KAUP. Teeth above in a single, sometimes irregular series; lower teeth uniserial.

b. Color not uniform light brown; nape with a broad blackish bar, edged before and behind with pale; dorsal and anal with a median dusky stripe; dorsal inserted above end of pectoral .... *cephalozona*. 31.

bb. Color uniform light brown; no bands on head; dorsal and anal pale, edged with white.

c. Dorsal fin inserted behind pectoral at a distance from gill opening nearly half head; dorsal and anal elevated on tail .... *urolophus*. 32.

cc. Dorsal fin inserted over middle of pectoral at a distance from gill opening less than one-fifth head; fins not elevated on the tail.......... *asakusæ*. 33.

aa. *Herpetoichthys* KAUP. Teeth above distinctly biserial; coloration uniform light brown, the fins pale.

d. Body rather stout, the depth 2⅓ in head; lower teeth uniserial; dorsal inserted over tip of pectoral.................................. *tsuchidæ*. 34.

dd. Body very slender, the depth rarely one-fourth the head; lower teeth biserial; dorsal inserted well behind pectoral .... *stenopterus*. 35.

31. OPHICHTHUS CEPHALOZONA Bleeker.

Centrurophis spadiceus Kaup, Apodes, 1856 fig. 1, (not description; not of Richardson).

Muraenopsis marginata Bleeker, Ned. Tydskr. Dierk., I, p. 179 (not of Peters).

Ophichthys cephalozona Bleeker, Atlas Ichth. Muraen., 1864, p. 49, pl. xii, fig. 2 (Singapore, Amboyna).—Kner, Novara Fische, p. 377.—Günther, Cat. Fish., VIII, p. 69, Amboyna, Cape York, Australia, Cebu, Philippine Islands, Japan.

Head 4 in trunk; head and trunk about as long as tail; mouth moderate, extending slightly beyond eye; snout pointed, the upper jaw much projecting; eye moderate, 2 in snout, situated in anterior third of head; posterior nostril in advance of eye; anterior with a broad tube. Premaxillary teeth stout, in an irregular group; these together with a pair in front of lower jaw stronger than the others, which are pointed, fixed, uniserial. Pectoral a little more than one-fourth of head. Dorsal inserted above end of pectoral.

Body purplish brown; nape with a very broad cross band of deep black, broadly edged with white in front and behind. Dorsal and anal tricolor, brownish at base, black and white along the margin. (Günther.) Pectoral dark. Three distinct pores behind rictus; snout and lower jaw with large pores.

East Indies, widely distributed, a specimen in the British Museum collected by Mr. Jamrach in "Japan." This belongs to a variety or perhaps distinct species, having the nuchal band less distinct, the body and fins marked with irregular dark-brown blotches and the dorsal fin without pale edge. (*κεφαλή*, head; *ζώνη*, band.)

32 OPHICHTHUS UROLOPHUS (Schlegel).

Conger urolophus Schlegel, Fauna Japonica, Poiss., 1847, p. 260, pl. cxiv, fig. 1 (Nagasaki.)

Ophichthys urolophus Günther, Cat. Fish., VIII, p. 73, after Schlegel.—Nystrom, K. Svensk, Vet. Akad. Handl. 1887, p. 46, Nagasaki.

Head 3 in trunk; cleft of mouth 3 in head; eye 1⅔ in snout; teeth uniserial in both jaws, those above in front somewhat irregular. Pectoral well developed, the dorsal beginning behind its tip, its distance from the gill opening about 2⅙ in head; vertical fins somewhat elevated at the tail.

Color uniform light brown; oblong brownish spots on head and nape above; fins pale, with a white margin. (Schlegel.)

Nagasaki, described from a large specimen, figured by Schlegel; not seen by subsequent writers unless our *O. asakusæ* is the same, which seems very unlikely. (*οὐρά*, tail; *λόφος*, crest.)

33. OPHICHTHUS ASAKUSÆ Jordan and Snyder, new species.

Head 2⅔ in trunk; head and trunk 1⅙ in tail; body very robust, the depth at gill opening 2½ in head; mouth rather small, its cleft 2⅔ in head; extending well beyond eye; snout short, blunt, depressed above, 5⅓ in head; eye moderate 1½ in snout; front of eye about equidistant between tip of snout and angle of mouth; teeth stout, short and rather sharp, subequal, in one irregular row above, the lower apparently uniserial; pectoral roundish, 4⅙ in head: dorsal inserted over middle of pectoral; distance from insertion of dorsal forward to gill opening 6 in head; the fin rather high, not elevated at the tail, the fin there lower than anteriorly; tail bluntish; pores in lateral line very small; head with longitudinal wrinkles.

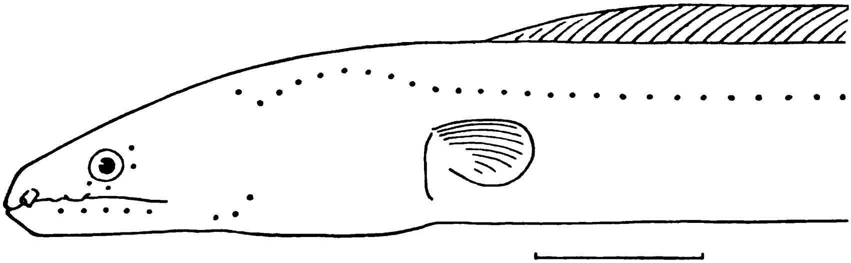

FIG. 18.—OPHICHTHUS ASAKUSÆ.

Color uniform olive brown, the belly paler, no dark streaks or points on head; dorsal and anal fins pale, the edge whitish.

One specimen 22¾ inches long, type No. 6478, Leland Stanford Junior University Museum, obtained from the Asakusa Aquarium in Tokyo, taken outside the Bay of Tokyo, near Misaki. The pale edge of the dorsal and anal are characteristic of the species. It is closely related to the species called *urolophus* by Schlegel, but in that species the dorsal is inserted well behind the pectoral at a distance behind the gill opening 2⅙ in head according to Schlegel's figure. Our specimen moreover shows no sign of the elevation of the dorsal and anal on the tail, which suggested the name *urolophus*.

34. OPHICHTHUS TSUCHIDÆ Jordan and Snyder, new species.

Head 2⅔ in trunk; head and trunk 1⅙ in tail. Body robust, the depth at gill opening 2½ in head. Mouth rather large, its cleft 2½ in head, the front of eye midway between tip of snout and angle of mouth; maxillary extending well beyond eye. Snout short, blunt, depressed above, 5⅔ in head; eye large, 1½ in snout. Teeth all sharp, subequal, those in upper jaw in two distinct series, those below

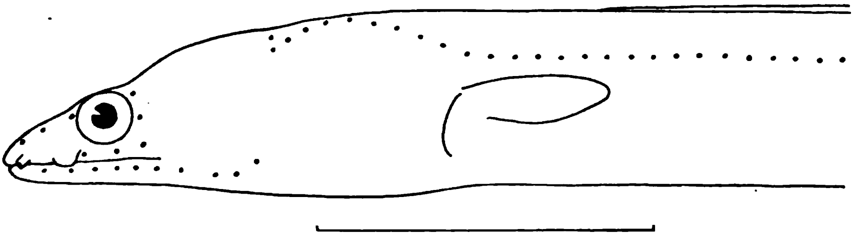

FIG. 19.—OPHICHTHUS TSUCHIDÆ.

uniserial. Pectorial rather pointed, 3 in head. Dorsal inserted over tip of pectoral, the fin rather low, not elevated at the tail, distance from gill opening to front of dorsal, 2½ in head; tail bluntish: pores in lateral line evident; skin of head wrinkled. Color uniform olive brown. made darker by dark points, belly paler; dorsal and anal pale, each with whitish border

One specimen, a foot long, from Misaki, No. 6479, Leland Stanford Junior University Museum, named for Mr. Tsuchida, asssistant to Dr. Mitsukuri in the seaside laboratory of the Imperial University at Misaki.

35. OPHICHTHUS STENOPTERUS Cope.

Ophichthus stenopterus COPE, Trans. Am. Phil. Soc., 1871, p. 482, Japan.

Tail nearly twice length of head and trunk. Teeth in two rows in each jaw; vomerine teeth mostly in two series; eye 2 in snout, pectoral 5 in head; dorsal beginning behind it at a point 1½ times length of fin. Dorsal and anal very low, each a mere fold in front. Brown above. white below; anal and dorsal white. Body very slender, much as in *O. lumbricoides* Bleeker. The depth in *lumbricoides* is less than one-fourth the head, but its fins are much higher than in O. *stenopterus*. (στενός, narrow; πτερόν, fin.) Two specimen said to be from Japan.

21. MYSTRIOPHIS Kaup.[1]

Mystriophis Kaup, Apodes, 1856, p. 10 (*rostellatus*).

Large eels, allied to *Ophichthus*, but distinguished by the presence of large canines on the jaws and vomer. Snout short, expanded at tip, suggesting the muzzle of a crocodile. Coloration plain. (μυστρίον, a spoon, from the form of the snout in *M. rostellatus;* ὄφις, snake.)

36. MYSTRIOPHIS PORPHYREUS (Schlegel.)

Ophisurus porphyreus SCHLEGEL, Fauna Japonica, Poiss., 1847, p. 265, pl. CXVI, fig. 1, Nagasaki.

Mystriophis porphyreus KAUP, Apodes, 1856, p. 10, after Schlegel.

Ophichthys rostellatus GÜNTHER, in part, not of Richardson. (Specimen from Japan, purchased from Herr Frank.)

Head 3 in trunk; head and trunk a very little shorter than tail. Cleft of mouth 2¼ in head; snout short, broad, flattened, slightly contracted behind its tip, like the snout of the crocodile, 9½ in head; eye 2 in snout. Teeth pointed, fixed, very unequal; those in front canine. Vomerine teeth very large, in one row, 4 or 5 in number; teeth in upper jaws in two very distinct rows, those of the outer row far apart and larger; lower jaw with a single row of large canines. Vertical fins moderate; pectoral rounded, 6 in head. Gill openings wide, close together. Dorsal beginning far behind pectoral, the distance behind gill opening two-thirds of length of head.

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[1] The American species hitherto referred to this genus have the vomerine teeth small and the snout narrowed. To these the name *Crotalopsis* Kaup (*Echiopsis* Kaup) should be applied. The species are spotted with black.

Purplish brown, streaky, paler below; head with some dark dots and wrinkles; pores on head not conspicuous. Pectoral pale; dorsal brownish, with the edge black; anal a little paler.

Coast of southern Japan, rather rare, here described from two specimens 3½ to 4 feet in length, taken at Wakanoura. Dr. Günther identifies the species with *Mystriophis rostellatus* from Senegal, but in the Japanese species the head is shorter, and the lower teeth are uniserial. This species is one of the largest of the Ophichthyoid eels. (πορφύρεος, purplish.)

22. BRACHYSOMOPHIS Kaup.

Brachysomophis Kaup, Apodes, 1856, p. 9 (*horridus.*)

? *Achirophichthys* Bleeker, Poissons Inéd. Murènes, Ned. Tijdschr. Dierk., II, p. 42 (*typus*=*crocodilinus* young).

This genus differs from *Mystriophis* chiefly in the presence of a conspicuous fringe of papillae on the lips. The vomerine teeth are canine. Species East Indian, doubtfully recorded from Japan. (βραχύς, short; σῶμα, body; ὄφις, snake.)

37. BRACHYSOMOPHIS CROCODILINUS (Bennett).

Ophisurus crocodilinus Bennett, Proc. Zoöl. Soc. Lond., 1833, p. 32, Mauritius.

Brachysomophis horridus Kaup, Apodes, 1856, p. 9, fig. 6, Otaheite.—Bleeker, Verh. Med. Ak. Amst., 1868, II, p. 303.

? *Achirophichthys typus* Bleeker, Ned. Tijdschr. Dierk., p. 42, Celebes.

Ophichthys crocodilinus Günther, Cat., VII, 1870, p. 64, Galapagos, Japan.

Brachysomophis crocodilinus Jordan and Davis, Apodal Fishes, 1892, p. 636.—Jordan and Evermann, Fish. N. M. America, after Günther.

Teeth unequal in size; maxillary teeth in a double row, those of the inner row stronger and less numerous than the outer; vomer and mandibular teeth uniserial, large canine teeth; head 3 in trunk; snout extremely short and rather flattened, scarcely twice as long as eye, which is small and situated in the anterior ninth of the length of the head; vertical fins moderately well developed; distance between the origin of dorsal fin and gill opening 2½ in head; pectoral small; body longer than tail. Upper parts brownish, minutely dotted with darker; a series of black pores along the lateral line, sometimes a whitish line across the occiput (Günther). East Indies, a specimen recorded by Günther from the Galapagos, and also recorded by Günther, with equal doubt, from Japan. (*Crocodilinus*, like a crocodile.)

23. OXYSTOMUS Rafinesque.

Oxystomus Rafinesque, Caratteri di Alcuni Generi, 1810, p. 62 (*hyalinus*=*serpens*; young).

Ophisurus Risso, Europe Merid., 1826, pp. 111, 206 (*serpens*, not of Rafinesque).

Leptognathus Swainson, Natur. Hist. Classn. Fish., II, 1839, p. 234 (*oxyrhynchus*=*serpens*).

Leptorhynchus Smith, Illustr. Fishes S. Afr., 1840 (*capensis*).

This genus is allied to *Ophichthus*, differing in the long and slender jaws, similar to those of *Oxyconger*, *Chlopsis*, and *Nettastoma*. The canine teeth are strong, as in *Mystrophis*, and the tail is much longer than the rest of the body. Pectorals well developed, the dorsal inserted well behind them. Teeth sharp. (ὀξύς, sharp; στόμα, mouth.)

38. OXYSTOMUS MACRORHYNCHUS Bleeker.

UMIHEBI (SEA SNAKE): DAINANHEBI (FORMOSA SNAKE).

Ophisurus serpens SCHLEGEL, Fauna Japonica, Poiss., 1847, p. 264, Nagasaki (not *Muræna serpens* Linnæus).

Ophichthys serpens GÜNTHER, Cat. Fish., VIII, 1870, p. 65, specimen from Japan.—ISHIKAWA, Prel. Cat., 1897, p. 6, Tokyo.

Ophisurus macrorhynchus BLEEKER, Verh. Bat. Gen. Muræn., XXV, 1852, p. 28, Japan.—BREVOORT, Exped. Japan, 1856, p. 283, Shimoda.

Head 4 in trunk; head and trunk 1⅘ in tail; depth of body 3½ in head; snout sharp 3⅘ in head (4 in large example); eye large, 3 in snout, nearer angle of mouth than tip of snout; cleft of mouth 1⅘ in head; teeth pointed, fixed, unequal, those above biserial on posterior part of jaw, those below uniserial; teeth of front of jaw and on vomer canine; upper jaw with a row of large pores; gill openings wide; pectoral 5 in head (6 in large example); the dorsal beginning behind tip of pectoral a distance about equal to length of pectoral.

Color brownish, sides and below silvery; pectoral brownish.

Coasts of Japan, not rare; two specimens received by us, the longest from Onasagawa, through Yonekichi Komeyama, 32 inches long; the other from Tokyo Bay, presented by Dr. Ishikawa; still another, over 4 feet long, is from Misaki. It is known as *Umihebi* or *Dainanhebi.*

The species is very close to *Oxystomus serpens* (Linnæus) of Europe, with which Dr. Günther identifies it. It seems to differ somewhat in measurements. The pectoral fin is a little larger, and the head shorter in relation to the trunk. At least, the two species should not be united without full comparison of specimens, though the published accounts of *O. serpens* indicate no difference of importance. (μακρός, long; ῥύγχος, snout.)

Family IX. MORINGUIDÆ.

Body cylindrical, more or less slender, the tail much shorter than rest of body, usually bluntish, with a fin at the top. Posterior nostrils in front of the small eye; mouth small; teeth small, uniserial; gill openings rather narrow, inferior. Heart placed far behind the gills. Pectorals small or wanting; dorsal fin low, mostly confined to the tail. Small eels of the tropical seas, often very slender or worm-like, and noted for the extreme shortness of the tail. The genera are closely related and two of them (*Moringua* = *Raitaboura* = *Stilbiscus* and *Aphthalmichthys*) are found in the West Indies as well as in the East.

a. Pectoral fin wanting or reduced to a slight scale-like appendage; vertical fins distinct only on the tail, not interrupted in the middle.......*Aphthalmichthys.* 24.

24. APHTHALMICHTHYS Kaup.

Aphthalmichthys Kaup, Apodes, 1856, p. 105 (*javanicus*).

This genus differs from *Moringua* in the little development of the fins. The pectorals are wanting or very nearly so, and the dorsal and anal form low ridges developed as fin only at the end of the tail. Eye very small; lower jaw projecting. (ἀ, privative; ὀφθαλμός, eye; ἰχθύς, fish.)

a. Body moderately slender, the depth 3 to 4 in head, 40 to 45 in entire length. *abbreviatus.* 39.

aa. Body excessively slender, the depth 3½ to 4 in head, 75 to 100 in entire length. *javanicus.* 40.

39. APHTHALMICHTHYS ABBREVIATUS Bleeker.

Aphthalmichthys abbreviatus Bleeker, Ned. Tyds. Dierks. I, about 1860, p. 163, Java, etc.; Atlas Ichth. Muræn., 1864, p. 17, pl. I, fig. 1, Java, Batu, Celebes, Ternate, Amboyna, Timor.

Moringua abbreviata Günther, Cat. Fish., VIII, 1870, p. 92.

Head 7 in trunk, 11⅓ in total; tail 3⅖ in total length; depth of body 4¼ in head, about 45 in total length; cleft of mouth 5 in head; dorsal fin beginning three heads' lengths from tip of tail; the anal a little farther forward; fin rays on tip of tail as long as eye and snout. Pectoral visible, but scarcely larger than eye. Color light brown.

East Indies, generally common, here described from a specimen 11½ inches long, taken by Capt. Alan Owston at Yaeyama, in the southern Riukiu Islands. It agrees in the main with Bleeker's figure, but has rather better developed fins. (*Abbreviatus*, shortened.)

40. APHTHALMICHTHYS JAVANICUS Kaup.

Aphthalmichthys javanicus Kaup, Apodes, 1856, p. 105, Java.—Bleeker, Ned. Tydsskr. Dierk., I, p. 164; Atlas Ichth. Muræn., 1864, p. 16, pl. II, fig. 2. Java, Celebes, Ceram, Timor.

Moringua javanica Günther, Cat. Fish., VIII, 1870, p. 92, Moluccas, Fiji, Japan.

Depth of body 75 to 100 times in length; head 15 to 22 times in body; vertical fins reduced to a fringe at end of tail. No pectorals. Brownish, paler below. (Bleeker.)

East Indies, recorded by Günther from Japan, doubtless the Riukiu Islands. Size larger than in *A. abbreviatus*, the body much more slender.

Family X. MURÆNIDÆ.

MORAYS.

The *Murænidæ* represent the most degenerate type of eels so far as the skeleton is concerned, and they are doubtless the farthest removed from the more typical fishes from which the eels have descended. The essential characters of the family are thus stated by Dr. Gill:

> Colocephalous Apodals with conic head, fully developed opercular apparatus, long and wide ethmoid, posterior maxillines, pauciserial teeth, roundish, lateral branchial

apertures, diversiform vertical fins, pectoral fins (typically) suppressed, scaleless skin, restricted interbranchial slits, and very imperfect branchial skeleton. with the fourth branchial arch modified, strengthened, and supporting pharyngeal jaws.

The Morays may be readily distinguished from the other eels by their small round gill openings and by the absence of pectorals. The body and fins are covered by a thick, leathery skin, the occipital region is elevated through the development of the strong muscles which move the lower jaw, and the jaws are usually narrow and armed with knife-like or else molar teeth. The Morays inhabit tropical and subtropical waters, being especially abundant in crevices about coral reefs. Many of the species reach a large size, and all are voracious and pugnacious. The coloration is usually strongly marked, the color cells being highly specialized. The genera 10 or 12; species 120. The *Murænidæ* without fins are the simplest in structure, but their characters are those of degradation, and they are farther removed from the primitive stock than such genera as *Muræna.*

a. Vertical fins well developed, the dorsal beginning on the head.
  b. Posterior nostrils as well as the anterior with a long tube .... *Muræna.* 25.
  bb. Posterior nostrils circular, without tube.
    c. Teeth all or nearly all sharp, the longer ones depressible canines.
      d. Body stout, the depth more than one-third length of head, the tail about as long as rest of body; vomerine teeth, if present, canine-like.
        e. Depressible canine teeth few (1 to 10 in number, all told). *Gymnothorax.* 26.
        ee. Depressible canines very numerous, about 30 in number, all told; teeth biserial; mouth large, not closing completely .... *Æmasia.* 27.
      dd. Body very slender, the depth less than one-third of head; tail longer than rest of body; mouth small .... *Strophidon.* 28.
    cc. Teeth mostly obtuse, molar-like; posterior nostrils without tube; mouth small; dorsal beginning before gill opening .... *Echidna.* 29.
aa. Vertical fins reduced to a rudiment on end of tail; teeth pointed; posterior nostril without tube; cleft of mouth not half head; snout moderate, about half length of gape .... *Uropterygius.* 30.

25. MURÆNA (Artedi) Linnæus.

MORAYS.

Muræna Artedi, Gen. Pisc., 1738, p. 23 (in part; includes all eels).
Muræna Linnæus, X, 1758, p. 243 (*helena*, etc.; includes all eels).
Murænophis Lacépède, Hist. Nat. Poiss., V, 1803, p. 630 (*helena*, etc.).
Limamuræna Kaup, Apodes, 1856, p. 95 (*guttata*).

This genus as now restricted contains numerous species found in the tropical seas, distinguished from all the rest of the family having developed fins by the presence of barbels on the posterior as well as the anterior nostrils. The teeth are all sharp and the dorsal fin begins on the head. (*μύραινα* (Moray), ancient name of *Muræna helena* of Europe.)

41. MURÆNA PARDALIS Schlegel.

Muræna pardalis SCHLEGEL, Fauna Japonica, Poiss., 1847, p. 268, pl. 119, Nagasaki.—BLEEKER, Act. Soc. Indo-Nederl., Japan, VI, p. 230, Japan; Nat. Tydsskr. Ned. Ind., XVI, p. 206.—GÜNTHER, Cat. Fish., VIII, 1870, p. 99, Mauritius.

Gymnothorax pardalis BLEEKER, Atlas Ichth. Muræn., 1864, p. 86, pl. XXV, fig. 1; pl. XXVI, fig. 2, Japan, Cocos, Java.

Head 2⅓ in trunk; tail a little longer than rest of body; body very robust, the depth 1⅖ in head; snout pointed, narrow, 3⅗ in head; posterior nostrils with very long tubes, 2 in snout, twice as long as anterior, which are shorter than eye; eye moderate, 2⅓ in snout, a little nearer angle of mouth than tip of snout; mouth very large, not closing completely, its cleft 2½ in head; canines strong; teeth in each jaw biserial in the young, becoming uniserial in the adult; about 10 canines on each side in lower jaw, besides smaller teeth; 2 depressible fangs on vomer.

Dark brown, clouded or vaguely barred with darker, the dark forming reticulations around pale areas; everywhere covered with numerous small round yellowish or whitish ocelli ringed with darker, these largest on the lower parts, and on head and belly; in the young white with dark cross bands, the white breaking up into spots with age, sometimes partly confluent; lower jaw with light and dark crossbars; no pale edgings to the fins.

East Indies, north to Japan, not rare. Our specimens, three in number, are from Wakanoura, the largest 25 inches long.

This species may be at once known from all other Japanese Morays by the four barbels on the snout. The spots on the body, white with black rings. are also different from any other. (πάρδαλις, leopard.)

26. GYMNOTHORAX Bloch.

Gymnothorax BLOCH, Ichthyol., IX, 1795, p. 85 (*reticularis*).

Lycodontis McCLELLAND, Calcutta Journ. Nat. Hist., V, 1844, p. 173 (*literata* = *tile*).

Thærodontis McCLELLAND, Calcutta Journ. Nat. Hist., V, 1844, p. 174 (*reticulata* = *tesselata*).

? *Sidera* KAUP, Apodes, 1856, p. 70 (*pfeifferi*) (vomerine teeth globular).

Eurymyctera KAUP, Apodes, 1856, p. 72 (*crudelis*).

Polyuranodon KAUP, Apodes, 1856, p. 96 (*kuhli* = *polyuranodon*).

Tæniophis KAUP, Aale Hamburg Mus., Nachtrage, 1859, p. 10 (*westphali* = *funebris*).

Priodonophis KAUP, Aalenähnliche Fische Hamburg. Museum, 1859, p. 22 (*ocellatus*).

Neomuræna GIRARD, U. S. Mex. Bound. Surv., Fishes, 1859, p. 76 (*nigromarginata-ocellatus*).

Pseudomuræna JOHNSON, Proc. Zool. Soc. London, 1860, p. 167 (*madeirensis*).

This genus, as here understood, comprises the great bulk of the *Murænidæ*, including all the species with sharp teeth, the vomer with a few depressible canines, the number of depressible teeth in the mouth less than ten; the body stout and not greatly elongate; the anterior nostrils only tubular, and the dorsal fin beginning on the head. The large canines, varying much in number, are usually depressible. The Morays of this genus are everywhere abundant in the tropical seas, where some of them reach a great size. They are the most active and voracious of the eels, often showing much pugnacity Most of them live in shallow water about rocks or reefs. (γυμνός, naked; θώραξ, chest, from the absence of pectoral fins. The name *Gymnothorax*, based on a Japanese Moray of this genus, must take the place of *Lycodontis*.)

a. *Gymnothorax:* Teeth of jaws uniserial; mouth closing completely.
  b. General color uniform purplish; dorsal and anal each with a broad white margin; dorsal fin high; jaws with large pores ....*albomarginata*. 42.
  bb. General color not uniform, the body much spotted or banded.
    c. Body mottled or spotted, without distinct dark cross bands.
      d. Body with spots or blotches, of varying forms, some or all of them paler than the ground color.
        e. Anal fin with a distinct white margin; light and dark markings arranged to form irregular diffuse cross bands; head 2 to 2½ in trunk..*kidako*. 43.
        ee. Anal fin without distinct white margin; head 2⅔ in trunk; body with dark lines and many whitish spots, some of them ring like. *mieroszewskii*. 44.
      dd. Body with roundish black spots darker than the ground color, the spots on head similar; head 2⅓ in trunk; tail longer than rest of body. *reevesii*. 45.
    cc. Body pale brown with about 20 broad dark bands, most distinct on belly; head and back finely spotted; mouth small ....*reticularis*. 46.

42. GYMNOTHORAX ALBIMARGINATUS (Schlegel).

??*Muræna hepatica* RÜPPELL, Atlas Fische, p. 120, Red Sea.—GÜNTHER, Cat. Fish., 1870, p. 122, Amboyna.

Muræna albimarginata SCHLEGEL, Fauna Japonica, 1847, p. 267, pl. CXVIII, Nagasaki.

Gymnothorax albimarginatus BLEEKER, Atlas Ichth. Muræn., p. 107, pl. XXXVII, fig. 2; pl. XL, fig. 3, Amboyna.

Head 3⅔ in trunk; tail nearly or quite as long as rest of body; teeth uniserial, the canines scarcely enlarged; mouth closing completely; snout thick, of moderate length; eye small, 2½ in snout, nearer to angle of mouth than tip of snout; cleft of mouth about 2⅔ in head; gill opening scarcely wider than eye; length of anterior nasal tubes less than vertical diameter of eye. Dorsal fin very high, beginning in advance of gill opening, the posterior rays higher than body below; jaws with large whitish pores, about 3 above and 5 below on each side.

Color uniform purplish brown, paler below; dorsal and anal each with a broad whitish margin. (Schlegel; Günther.)

East Indies, north to Kiusiu, not seen by us. Dr Günther identifies the species with *Gymnothorax hepaticus* (Rüppell), an earlier named species from the Red Sea. But as Bleeker observes, this identity is not yet proved, and Dr. Day records neither of them from India. (*Albus*, white; *marginatus*, edged.)

43. GYMNOTHORAX KIDAKO (Schlegel).

KIDAKO; KICHIGAIUNAGI; UTSUBO.

Muræna kidako SCHLEGEL, Fauna Japonica, Poiss., 1846, p. 266, pl. CXVII, Nagasaki.—BREVOORT, Exped. Japan, 1856, p. 283, Shimoda.—NYSTROM, K. Svensk. Vet. Akad. Handl., 1887, p. 46, Nagasaki.

Muræna similis RICHARDSON, Voy. Erebus and Terror, 1847, p. 83, Japan.—KAUP, Apodes, 1856, p. 63.

Muræna nubila GÜNTHER, Cat. Fish., VIII, 1870, p. 117, Japan (not of Richardson).—ISHIKAWA, Prel. Cat., 1897, p. 5, Sagami.

Head 2 to 2½ in trunk; 6⅓ in total length; head and trunk a little shorter than tail. Skin smooth; cleft of mouth large, 2⅓ in head; mouth closing completely; teeth rather broad, all in single series, without basal lobes; mandible with about 16 teeth on each side; vomer with one row of depressible teeth; nasal tube rather shorter than eye, which is nearly 2 in snout; snout 5 in head, compressed and somewhat produced; eye a little nearer tip of snout than angle of mouth; gill opening not so wide as eye.

Color dark brown or black, everywhere blotched or spotted with white or yellowish, the white or yellowish closely mixed with the dark ground color, both light and dark colors confluent in irregular transverse bands. In some specimens light colors prevail, in others the dark; gill opening dark; angle of mouth black without white spot before it; no white pores on lower jaw; belly colored like sides, but the white markings more conspicuous; dorsal beginning well in front of gill opening, colored like the body with dark brown and white mottlings; no marginal stripe; anal black, with a very distinct white margin, chin and throat with traces of dark streaks.

Coasts of Japan, generally common, varying much in shade and degree of mottling from almost gray to almost black. It may be, however, always distinguished by the white stripe along the black anal. Our specimens, ten in number, are from Tokyo, Misaki, and Wakanoura. This species is placed by Dr. Günther in the synonymy of *Muræna nubilis*, from the East Indies, but that species has a black margin to the dorsal, as well as the anal. The specimen described above (Misaki) is 24½ inches long.

As Richardson, in his account of the eels of the "Voyage of the *Erebus* and *Terror*" acknowledges the receipt of Schlegel's account of the eels of the "Fauna Japonica," we must consider that Schlegel's name *kidako* has priority over Richardson's name *similis* for the common Japanese Moray. (*Kidako*, the common Japanese name.)

44. GYMNOTHORAX MIEROSZEWSKII (Steindachner).

Muræna mieroszewskii STEINDACHNER, Reise Sr. Maj. Schiff Aurora, 1898, p. 222, Kobe.

Head 2⅜ in trunk; head and trunk as long as tail; snout 4¾ in head; cleft of mouth 2⅛; greatest depth of body 1⅛ in head; eye 2½ in snout; mouth not closing; the cleft long, the teeth pointed, with the points turned backward, all one-rowed, about 13 on each side in each jaw; no teeth on vomer; anterior nasal tube half eye; posterior nostril without tube; gill opening as large as eye.

Body with the skin wrinkled, color light and dark brownish violet, covered with innumerable crossing lines of violet brown and close-set, diffuse, roundish spots of brownish white, occasionally ring-like; black furrows between angle of mouth and gill opening; region of gill opening, angle of mouth, and lower margin of eye diffusely blackish; front of head above and below dark grayish-violet; tail darker than rest of body; spots on tail smaller, closer-set and better defined, the reticulate lines less distinct. (Steindachner.)

Described from a specimen 85 cm. long, obtained at Kobe by Dr. C. Ritter von Mieroszewski, surgeon of the Austrian frigate *Aurora*, for whom the species was named.

45. GYMNOTHORAX REEVESI (Richardson).

Muræna reevesi RICHARDSON, Voyage Sulphur, 1848, p. 109, pl. XLIX, fig. 2, on a Chinese drawing made for John Reeves, of Canton.—GÜNTHER, Cat. Fish., VIII, 1870, p. 107, "Japan."

Head 2⅓ in trunk; tail longer than rest of body; cleft of mouth wide, 2⅙ to 2⅓ in head; snout compressed, rather short; eye moderate, more than half snout, nearer tip of snout than angle of mouth. Anterior nasal tubes short; gill opening not wider than eye; mouth closing completely; canines moderate, few in number; teeth uniserial, without basal lobes, about 17 on each side of mandible.

Color dark brown, with several series of indistinct black round spots, longitudinally arranged and about as large as eye; head with spots similar in size and form to those of body; fins without pale margin. (Günther.)

Coasts of China, not seen by us, recorded by Günther from Japan, (collection Jamrach), probably from the Riukiu Islands. (Named for John Reeves, of Canton.)

46. GYMNOTHORAX RETICULARIS Bloch.

Gymnothorax reticularis BLOCH, Ausländische Fische, IX, 1795, p. 85, pl. CCCCXVI, Indian Ocean.—SCHNEIDER, Syst. Ichth., 1801, p. 528 (copied).

Murænophis reticularis LACÉPÈDE, Hist. Nat. Poiss., V, 1803, p. 628 (copied).

Muræna reticularis GÜNTHER, Cat. Fish., VIII, 1870, p. 105, China Sea, Japan.—ISHIKAWA, Prel. Cat., 1897, p. 5, Tokio.

Muræna reticulata Richardson, Voyage Erebus and Terror, 1847, p. 82, Sea of Borneo.—Kaup, Apodes, 1856, p. 60, fig. xlix.

Muræna minor Schlegel, Fauna Japonica, Poiss., 1846, p. 269, pl. cxv, fig. 2, Nagasaki.

Priodonophis minor Bleeker, Verh. Bat. Gen., XXVI, p. 123.—Kner, Novara Fische, p. 382.

Head 2⅙ in trunk; 7⅙ in total length; head and trunk a little shorter than tail; snout short, blunt, 8 in head; nasal tube very short, about half eye, which is 1⅓ in snout; mouth closing completely; cleft of mouth 3¼ in head; teeth one-rowed, their points turned backward, the edges of some slightly serrated, about 14 on each side of mandible; a large depressible canine on vomer; the other teeth all or nearly all fixed; gill opening scarcely as large as eye, the dorsal beginning well before it; dorsal rather high.

Yellowish or whitish brown, with 15 to 22 dark cross bands made up of different brown spots, these mostly turning into black on the belly, where they are very distinct; they are also more distinct on the dorsal fin; upper parts everywhere on bands and between them closely covered with dark-brown spots of different sizes; lower jaw with cross bands of spots. There is considerable variation in the ground color and in the clearness of the bands and spots. The bands are very distinct on the ventral line. In life the pale markings have a pinkish shade.

Of this small moray, we have five specimens, the largest 22½ inches long, from Wakanoura, and one from Misaki.

It can be confounded with no other species in Japanese waters, as no other has dark bands distinct on the belly. (*Reticularis*, netted.)

27. ÆMASIA Jordan and Snyder, new genus.

Æmasia Jordan and Snyder, new genus (*lichenosa*).

This genus differs from *Gymnothorax* in the large mouth and very numerous depressible fang-like canines, there being about 30 of these in all on jaws and vomer. Teeth in both jaws biserial, mouth not closing completely. Doubtless some of the species hitherto referred to *Gymnothorax* belong to this genus, but none of them known to us have such an array of bristling teeth as the type of Æmasia. (*αἱμασιά*, a hedge, from the bristling teeth.)

47. ÆMASIA LICHENOSA Jordan and Snyder, new species.

Head 2⅙ in trunk, 7 in total length; head and trunk a little shorter than tail; body robust, the depth about half head; mouth very large, the jaws not closing completely; cleft of mouth 2⅙ in head; teeth very sharp, mostly set vertically, the long slender canines in inner series of both jaws and on vomer depressible; teeth on both jaws and vomer biserial, the teeth on vomer largest; about 18 large teeth on each side of lower jaw; about 30 depressible canines in all within the mouth;

nasal tubes much shorter than eye; snout sharp, 4½ in head; eye 2¼ in snout, nearer to angle of mouth than to its tip; gill opening about as large as eye, dorsal beginning somewhat before it.

Color very dark brown, almost black, everywhere blotched with light gray, like spots of lichen; three rows of larger spots on each side, besides many smaller ones, all very irregular in form; smaller spots of similar character on head; spots of body larger toward head; on belly the ground color is reduced to irregular reticulations; dorsal and anal fins colored like the body without light or dark edgings; no black at angle of mouth or around gill opening. This species is strongly distinguished by its dentition, there being about 30 large depressible teeth or fangs in its mouth. The absence of pale edge to the anal separates it at sight from *Gymnothorax kidako*, which it resembles in color, although its pale markings take the form of lichen-like blotches rather than irregular crossbars.

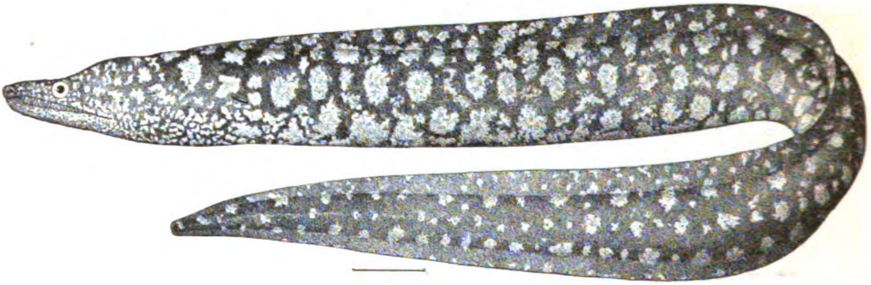


FIG. 20.—ÆMASIA LICHENOSA.

Of this interesting species two specimens, each about 22 inches long, were obtained, the one at Wakanoura, the other at Misaki. On the specimen from Wakanoura, the pale spots are smaller and less conspicuous than on the other.

Type No. 6480, Leland Stanford Junior University Museum. Locality, Wakanoura. (*Lichenosus*, covered with lichens.)

28. STROPHIDON McClelland.

Strophidon McCLELLAND, Calcutta Journ. Nat. Hist., V, 1844, p. 187 (*longicaudata*=*sathete*).

Pseudechidna BLEEKER, Atlas Ichth., Muræn., 1864, p. 109, pl. VIII (no description; changed to *Strophidon* in text).

This genus contains morays distinguished by the extreme length and slenderness of the body and the great number of the fin rays (D. 628, A. 355 in *S. brummeri*). The species of *Gymnothorax* have D. 250 to 400, A. 150 to 280. The tail is not twice as long as rest of body. The snout is small, and the dorsal begins well forward of the gill opening on the head. Species few. (στροφή, twist; ὀδούς, tooth.)

48. STROPHIDON BRUMMERI Bleeker.

Muræna brummeri BLEEKER, Nat. Tyds. Ned. Ind., XVII, p. 137, Timor.
Strophidon or *Pseudechidna brummeri* BLEEKER, Atlas Ichth., Muræn., p. 109, pl. XVIII, fig. 1, Timor, Ceram.
Muræna brummeri GÜNTHER, Cat. Fish., VIII, 1870, p. 128, Timor.

Body and tail very slender, the head 5⅔ in trunk, the tail one-third longer than rest of body. Cleft of mouth 3⅓ in head; teeth in single rows; mouth closing completely. Dorsal rather high, inserted at end of second third of length of head, more than half as high as body.

Uniform rather light brown; the head with numerous dark dots, especially on the jaws; the fins with white margin.

East Indies, here described from a specimen 23½ inches long, taken by Capt. Alan Owston, at low tide, at Yaeyama, Ishigaki Islands, Southern Riukiu. (A personal name.)

29. ECHIDNA Foster.

Echidna FOSTER, Enchiridion, 1778, p. 31 (*variegata*).
Gymnomuræna LACÉPÈDE, Hist. Nat. Poiss., V, 1803, p. 648 (*doliata*).
Gymnopsis RAFINESQUE, Analyse de la Natur, 1815, p. 93 (*doliata*).
Megadera RAFINESQUE, Analyse de la Natur, 1815, p. 93 (*variegata*).
Molarii RICHARDSON, Voy. Erebus and Terror, 1846, p. 79 (*ophis*=*nebulosa*).
Pœcilophis KAUP, Apodes, 1856, p. 98 (*catenatus*).

This genus is distinguished from *Gymnothorax* by its blunt teeth. The mouth is small and the body little elongate. The name *Echidna* was applied to this group of morays long before its use by Cuvier for a genus of Australian Monotremes. (ἔχιδνα, ἔχις, viper.)

49. ECHIDNA KISHINOUYEI Jordan and Snyder, new species.

Head 3¼ in trunk; head and trunk 1½ in tail; body rather deep, the depth 19 in length; cleft of mouth 2⅗ in head; teeth above in one series in front, in two or three series behind; the posterior teeth smaller and blunt; lower teeth mostly uniserial; mouth closing completely; eye small; snout short, blunt, about 7 in head; dorsal high,

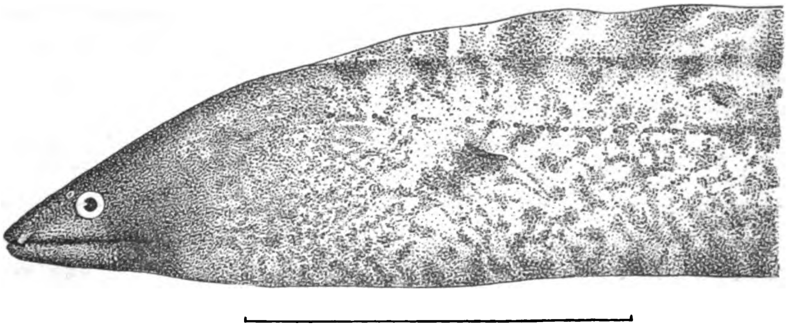


FIG. 21.—ECHIDNA KISHINOUYEI.

beginning well before gill opening at end of second third of head; lower jaw with a few large pores.

Light brown, everywhere closely marbled with dark brown, above and below, the dark streaks confluent; head largely dark brown; gill opening a little darker.

One specimen 12½ inches long, Type No. 6481, Leland Stanford Junior University Museum, taken at Okinawa, in the northern Riu Kiu by Yonekichi Komeyama. The species is nearer *Echidna delicatula* Kaup, but both trunk and tail are proportionately longer. The dorsal in *E. amblyodon* is inserted farther back.

It is named for Professor Kishinouye, of the Imperial Fisheries Bureau, in recognition of his deep interest in the fish fauna of Japan.

30. UROPTERYGIUS Rüppell.

Ichthyophis LESSON, Voyage de la Coquille, II, 1830, p. 120 (*pantherinus*=*marmoratus*; not of Fitzinger, 1829, a genus of Reptiles).

Uropterygius RÜPPELL, Neue Wirbelthiere, Fische, 1838, p. 83 (*concolor*).

Gymnomuræna GÜNTHER, Cat. Fish., VIII, 1870, p. 133 (not of Lacépède, which is Echidna).

Scutica JORDAN and EVERMANN, Fish N. M. America, I., 1896, p. 403 (*necturus*).

This genus contains those morays which have the fins altogether wanting or developed only at the tip of the tail; the teeth are small, pointed, subequal, the mouth of moderate size, and the anterior nostrils only provided with a tube. The typical species have the tail about as long as the rest of the body, but the single Japanese species agrees with the related genus *Channomuræna* in the extreme shortness of the tail. The typical species have tubes on the anterior nostrils only. These, by some error, were indicated by Jordan and Evermann as forming a distinct subgenus, *Scutica*, but *Scutica* is an exact synonym of *Uropterygius*. The species having tubes on the posterior nostrils should have been set apart from the others. For this group, the type being *Ichthyophis tigrinus* Lesson, we may suggest the new generic name, *Scuticaria*. *Murænoblenna*, used for this group by Kaup, is not available, as its orignal type was a *Myxine*. (*οὐρά*, tail; *πτερύγιον*, a little fin.)

50. UROPTERYGIUS OKINAWÆ Jordan and Snyder, new species.

Head 8⅙ in trunk, 13⅓ in total length; depth 2 in head; tail very short, 2$\frac{1}{10}$ in rest of body; snout very blunt, not depressed, 6 in head; cleft of mouth 2¾ in head; lower jaw slightly projecting; eye very small, 3 in snout; anterior nostrils with a slight tube, shorter than eye; posterior nostril with a low rim, placed over front of eye; mouth closing completely; teeth numerous, sharp, in two rows in each jaw, and on vomer; canines of vomer and of inner series of jaws depressible; about 20 teeth on each side of mandible; no conspicuous pores on head, except 2 or 3 on anterior part of edge of upper jaw; no trace of fins except a very slight fold on top of tail.

Color uniform cinnamon brown above and below; a darker shade about gill opening.

One specimen in excellent condition, No. 6482, Leland Stanford Junior University Museum, from Okinawa, in the northern Riu Kiu, collected by Yonekichi Komeyama, of Tokyo. It is distinguished from other species of the genus by the very long body and very short tail. From other Japanese morays, the absence of fins on the back at once separates it.

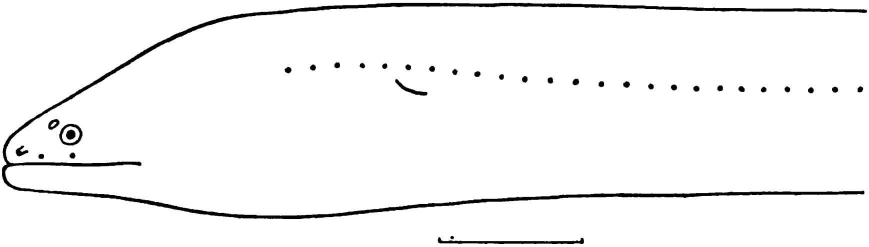


FIG. 22.—UROPTERYGIUS OKINAWÆ.

RECAPITULATION.

Order SYMBRANCHIA.

Family I. MONOPTERIDÆ.

1. *Monopterus* Lacépède.

   1. *albus* (Zuiew). Okinawa, Amami-Oshema.

Order APODES.

Suborder ENCHELYCEPHALI.

Family II. ANGUILLIDÆ.

2. *Anguilla* Shaw.

   2. *japonica* Schlegel. Hakodate, Aomori, Same, Matsushima, Sendai, Tokyo, Misaki, Wakanoura, Omura Bay, Kurume, Nagasaki.

Family III. SYNAPHOBRANCHIDÆ.

3. *Synaphobranchus* Johnson.

   3. *affinis* (Günther). Totomi Bay, Tokyo, Misaki.
   4. *iraconis* Jordan and Snyder. Myiako.
   5. *jenkinsi* Jordan and Snyder. Enoshima.

4. *Histiobranchus* Gill.

   6. *bathybius* (Günther). Not taken by us.

Family IV. Leptocephalidæ.

5. *Leptocephalus* Scopoli.

7. *myriaster* (Brevoort). Hakodate, Mororan, Matsushima, Same, Tokyo, Misaki, Hakata, Hiroshima, Wakanoura, Kobe, Onomichi, Nagasaki.
8. *erebennus* Jordan and Snyder. Misaki, Wakanoura.
9. *kiusiuanus* Jordan and Snyder. Hakata.
10. *japonicus* Bleeker. Not seen.
(a) *heterognathus* Bleeker. Not seen.
11. *riukiuanus* Jordan and Snyder. Yaeyama, Ishigaki Islands.
12. *nystromi* Jordan and Snyder. Nagasaki.
13. *retrotinctus* Jordan and Snyder. Tokyo.

6. *Congrellus* Ogilby.

14. *megastomus* (Günther). Misaki, Totomi.
15. *anago* (Schlegel). Tokyo, Misaki, Kobe, Wakanoura, Nagasaki.

Family V. Muræncsocidæ.

7. *Murænesox* McClelland.

16. *cinereus* (Forskål). Tokyo, Misaki, Tsuruga, Wakanoura, Onomichi, Hiroshima, Nagasaki.

8. *Oxyconger* Bleeker.

17. *leptognathus* Bleeker. Awa.

Family VI. Nettastomidæ.

9. *Nettastoma* Rafinesque.

18. *parviceps* Günther. Not seen by us.

10. *Chlopsis* Rafinesque.

19. *fierasfer* Jordan and Snyder. Wakanoura.

Family VII. Myridæ.

11. *Myrus* Kaup.

20. *uropterus* (Schlegel). Not seen by us.

12. *Murænichthys* Bleeker.

21. *owstoni* Jordan and Snyder. Yaeyama, Riukiu.
22. *hattæ* Jordan and Snyder. Wakanoura.
23. *aoki* Jordan and Snyder. Misaki.

Family VIII. Ophichthyidæ.

13. *Sphagebranchus* Bloch.

24. *moseri* Jordan and Snyder. Suruga Bay.

14. *Callechelys* Kaup.

25. *melanotænia* Bleeker. Yaeyama.

15. *Leiuranus* Bleeker.

26. *semicinctus* (Lay and Bennett). Yaeyama.

Family VIII. OPHICHTHYIDÆ—Continued.

16. *Chlevastes* Jordan and Snyder.

27. *colubrinus* (Boddaert). Yaeyama.

17. *Pisoodonophis* Kaup.

28. *zophistius* Jordan and Snyder. Misaki.

18. *Xyrias* Jordan and Snyder.

29. *revulsus* Jordan and Snyder. Misaki.

19. *Microdonophis* Kaup.

30. *erabo* Jordan and Snyder. Misaki, Awa, Okinawa.

20. *Ophichthus* Ahl.

31. *cephalozona* Bleeker. Not seen.
32. *urolophus* (Schlegel). Not seen.
33. *asakusæ* Jordan and Snyder. Misaki.
34. *tsuchidæ* Jordan and Snyder. Misaki.
35. *stenopterus* Cope. Not seen.

21. *Mystriophis* Kaup.

36. *porphyreus* (Schlegel). Wakanoura.

22. *Brachysomophis* Kaup.

37. *crocodilinus* (Bennett). Not seen.

23. *Oxystomus* Rafinesque.

38. *macrorhynchus* Bleeker. Misaki, Onasagawa, Tokyo.

Family IX. MORINGUIDÆ.

24. *Aphthalmichthys* Kaup.

39. *abbreviatus* Bleeker. Yaevama.
40. *javanicus* Kaup. Not seen.

Suborder COLOCEPHALI.

Family X. MURÆNIDÆ.

25. *Muræna* Linnæus.

41. *pardalis* Schlegel. Wakanoura.

26. *Gymnothorax* Bloch.

42. *albimarginatus* (Schlegel). Not seen.
43. *kidako* (Schlegel). Tokyo; Misaki, Wakanoura.
44. *mieroszewskii* (Steindachner). Not seen.
45. *reevesi* (Richardson). Not seen.
46. *reticularis* Bloch. Wakanoura; Misaki.

Family X. MURÆNIDÆ—Continued.

27. *Æmasia* Jordan and Snyder.

47. *lichenosa* Jordan and Snyder. Wakanoura; Misaki.

28. *Strophidon* McClelland.

48. *brummeri* Bleeker. Yaeyama.

29. *Echidna* Forster.

49. *kishinouyei* Jordan and Snyder. Okinawa.

30. *Uropterygius* Rüppell.

50. *okinawæ* Jordan and Snyder. Okinawa.

A REVIEW OF THE CARDINAL FISHES OF JAPAN.

By David Starr Jordan and John Otterbein Snyder,
Of the Leland Stanford Junior University.

In the present paper the species of *Apogonidæ* known from the waters of Japan are brought under consideration. It is based on collections obtained by the authors in 1900 for Leland Stanford Junior University, as well as upon a study of the Japanese fishes belonging to the United States National Museum. A series of duplicates of the fishes collected by the authors has been placed in the United States National Museum.

Family APOGONIDÆ.

CARDINAL FISHES.

Body oblong or elongate, sometimes compressed and elevated, covered with rather large scales, which are striated and ctenoid, or sometimes cycloid; cheeks scaly; lateral line continuous; cleft of mouth wide, oblique; villiform teeth on jaws and vomer, and sometimes on palatines; canines sometimes present (teeth wanting in *Brephostoma*); preopercle with a single or double ridge, its edges entire or serrated; opercular spine little developed; lower pharyngeals separate, with sharp teeth; pseudo-branchiæ present; branchiostegals 6 or 7. Dorsal fins well separated, the first with 6 to 9 rather strong spines; no dorsal sheath or furrow; anal fin short, with 2 or 3 spines; ventral fins thoracic, I, 5, without axillary scale. Gill-rakers slender; gill membranes separate, free from the isthmus. Small fishes of the Tropics, especially abundant in the East Indies, some of them in fresh waters, most of them in rather deep waters. In Japan, notwithstanding their small size, they have great importance in the markets as food-fishes.

a. Vent posterior, not far from front of anal fin.
  b. *Apogoninæ.* Anal spines 2; body oblong; teeth present, in jaws at least; preopercle with a double ridge.
    c. Canine teeth none, the teeth all villiform; lateral line normal; palatines with teeth.
      d. Scales large, 20 to 30 in lateral line.
        e. Preopercle with its margins entire; dorsal spines 7; anal with 8 to 12 soft rays...*Apogonichthys.* 1.

ee. Preopercle with its margins both serrate, at least in the young.
f. Anal with 8 to 10 soft rays; first dorsal with 6 or 7 spines.....*Apogon.* 2.
ff. Anal with 13 to 17 soft rays; first dorsal with 6 spines....*Archamia.* 3.
cc. Canine teeth present; scales large; anal with 7 to 9 soft rays.
g. Dorsal spines 6; preopercle serrate........................*Paramia.* 4.
gg. Dorsal spines 8 or 9; preopercle with no bony serrations.
h. Jaws with a few canines and a band of villiform teeth; scales large (about 36) ....*Melanostoma.* 5.
hh. Jaws with many canines and no villiform teeth; scales small (about 62) ....*Telescopias.* 6.
bb. *Scombropinæ.* Anal spines 3 or 4; body elongate; mouth large; soft dorsal and anal long of 12 to 13 soft rays; dorsal spines 8; scales small; preopercle with a single ridge...*Scombrops.* 7.
aa. *Acropominæ.* Vent anterior, nearer root of ventrals than origin of anal; operculum produced in a long, denticulated point; preopercle entire; jaws with small canines; palatines with teeth; scales moderate; lower jaw longest. D. VII-I, 10. A. III, 7..*Acropoma.* 8.

1. APOGONICHTHYS Bleeker.

Apogonichthys BLEEKER, Floris, 1854, p. 321 (*perdix*).

This genus differs from *Apogon* only in having the preopercle entire at all ages; scales very large (20 to 26) and cycloid. Dorsal spines 7 in typical species, the soft dorsal and anal with 9 to 12 rays. Small species, similar in habit to those of *Apogon*, found in the tropical seas. (*Apogon*; ἰχθύς, fish; α, without; πώγων, beard, being thus distinguished from the bearded mullet, *Mullus barbatus*.)

a. Soft dorsal with a large black ocellus at the base of its last 4 rays; anal black edged...*carinatus.* 1.
aa. Soft dorsal edged with black, but without black ocellus at base; anal pale. *glaga.* 2.

1. APOGONICHTHYS CARINATUS (Cuvier and Valenciennes).

ICHIMOCHI.

Apogon carinatus CUVIER and VALENCIENNES, Hist. Nat., Poiss., II, 1828, p. 157, Japan, Coll. Langsdorff.—SCHLEGEL, Fauna Japonica, Poiss., 1846, p. 3, Nagasaki.—NYSTROM, Handl. Svensk. Vet. Akad., 1887, p. 8, Nagasaki.
Apogonichthys carinatus BLEEKER, Floris, 1854., p. 321; Verh. Bat. Genootsch., XXVI, p. 56, pl. I, fig. 3.—GÜNTHER, Cat. Fish., I, 1870, p. 247, after Bleeker.

Head 2⅘ in length; depth 2⅔; depth of caudal peduncle 2 in head; eye 3½; interorbital space 3½; snout 4¼; maxillary 1⅘; D. VII-I, 9; A. II, 8; scales in lateral series 25; in transverse series 9.

Body rather robust; the head large. Interorbital space somewhat convex. Snout about equal to diameter of eye. Mouth large; very oblique; lower jaw slightly projecting; maxillary extending beyond pupil, sometimes reaching beyond posterior border of eye. Spinous dorsal low. Soft dorsal and anal high, in some specimens almost reaching base of caudal when depressed. Caudal truncate posteriorly.

Dull reddish olive, the edges of the scales sometimes but not always dusky; head dusky above on the naked rugose skin. First dorsal largely black; second dorsal with a large jet black spot at base of the last 4 rays; this in highly colored specimens surrounded by a yellowish ring. Anal with a black edge. Caudal dusky behind. Paired fins pale.

Coast of Japan and southward. Our specimens are from Misaki, Wakanoura, and Nagasaki. From Misaki we have a single large example, here figured, which is much darker in color than the others, each scale having a broad edging of black points. Except in color no other difference appears. Length 100 to 150 millimeters.

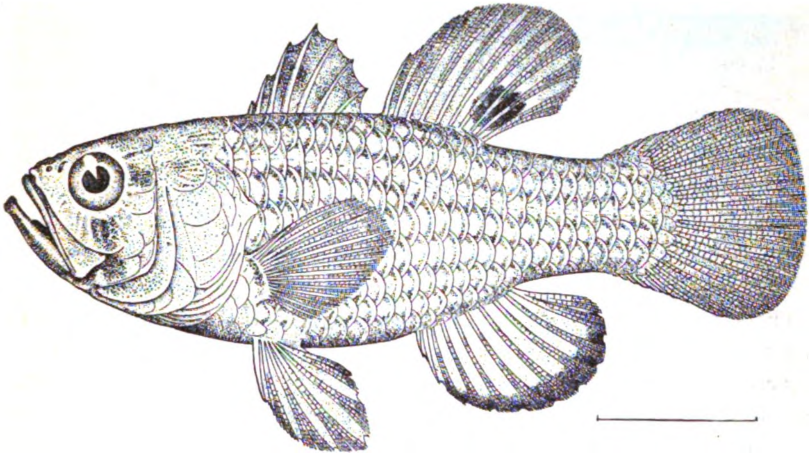


FIG. 1.—APOGONICHTHYS CARINATUS.

(*Carinatus*, keeled, from the prominent lateral line, a character of no importance.)

2. APOGONICHTHYS GLAGA (Bleeker).

Apogon glaga BLEEKER, Verh. Bat. Gen., XXII, Percoiden, p. 29.—DAY, Fishes India, p. 62, pl. XVI, fig. 10.

Apogonichthys glaga BLEEKER, Verh. Bat. Gen. XXVI, Ichth. Japan, p. 57.—GÜNTHER, Cat. Fish., I, p. 247.

Amia glaga BLEEKER, Atlas Ichth. Percoid., 1876, p. 100, pl. XXXIII, fig. 1, Singapore, Bangka, Java.

Head 2⅘ in length; depth 2¾; eye 4 in head; D. VII–I, 9 or 10; A. II, 8 or 9. Scales 25. Body rather deep, the back elevated; maxillary extending a little beyond eye; dorsal spines short and slender; caudal truncate.

Color olivaceous, reddish below; sides with small blue spots arranged in lines along the rows of scales; no caudal spot; first dorsal dull orange; second, black at tip with small pale spots on the membranes; no black ocellus; caudal black at tip; pectorals, anal, and ventrals light yellow.

East Indies, said by Bleeker to range northward to Japan.[1] It is likely that faded specimens of *A. carinatus* have been mistaken for it. It may be easily recognized by the absence of dorsal ocellus and of serræ on the preopercle. (*Glaga*, the Malay name.)

2. APOGON Lacépède.

Amia Gronow, Zoophyl., 1763, p. 80 (*moluccensis;* nonbinomial).—Gill, Proc. Acad. Nat. Sci. Phila., 1862, p. 237 (*imberbis;* scales 20 to 28).

Apogon Lacépède, Hist. Nat. Poiss., III, 1802, p. 411 (*ruber=imberbis*).

Ostorhinchus Lacépède, Hist. Nat. Poiss., IV, 1802, p. 165 (*fleurieu*).

Monoprion Poey, Memorias, II, 1860, p. 123 (*maculatus*).

? *Lepidamia* Gill, Proc. Acad. Nat. Sci. Phila., 1863, p. 81 (*kalosoma;* scales 33 to 38).

Mionurus Krefft, Proc. Zool. Soc. Lond., 1867, p. 942 (*lunatus*)

Body oblong, compressed, covered with large, ctenoid scales. Lateral line continuous, with 20 to 30 scales. Head large; mouth wide, oblique, the maxillary extending to below middle of the large eye; villiform teeth on jaws, vomer, and palatines; no canine teeth; preopercle with a double ridge, the edge somewhat serrate, at least in the young, becoming entire with age in some species; opercle with a spine behind. Gill rakers rather long. Dorsal spines 6 or 7, strong; second dorsal remote, short; anal with 2 spines and 8 or 9 soft rays, the second much the longer, the soft part similar to the soft dorsal; pectorals and ventrals moderate; caudal concave or convex; vertebræ 11+14=25. Warm seas; the species numerous. The species are much alike in form, but differ greatly in markings, the ground color being usually bright red or reddish silvery. The principal groups differ in number of dorsal spines and in the form of the caudal. Most of the Pacific species belong to the subgenus *Ostorhinchus*; all of the Atlantic to the typical subgenus *Apogon*.

I. *Ostorhinchus*. First dorsal with seven spines.
  a. Caudal fin rounded or subtruncate, its base without distinct round black spot; sides without black lateral stripe.
    b. Side without narrow vertical brown bars.
      c. Fins blackish or with black markings.
        d. Top of head dusky, without conspicuous black dots; preopercle without black line; body deep; scales firm; fins blackish; caudal and pectoral yellowish .... *niger*. 3.
        dd. Top of head sprinkled with very distinct black dots; a black line along inner margin of preopercle; spinous dorsal black at tip; soft dorsal with two black bands .... *marginatus*. 4.
      cc. Fins all pale; body without black markings .... *unicolor*. 5.
    bb. Side with 8 to 12 narrow brownish vertical crossbars, the ground color silvery; dorsals and caudal obscurely dark edged; scales thin ..*lineatus*. 6.
  aa. Caudal fin lunate or forked; dark stripes, if present, horizontal; base of caudal with a very distinct round black spot; snout pointed.
      e. Sides of body with 3 to 7 stripes extending from head to tail.

---

[1] *L'Amia glaga* dont je posside aussi des individus provenant du Japon (Bleeker).

f. Distinct stripes on side, at least 4 in number, the upper and lower of the four converging over and behind the caudal spot; top of head with 4 or more stripes.........................*schlegeli.* 7.

ff. Distinct stripes on sides, 3 in number, the upper and lower not converging behind caudal spot; dark stripes plain on the cheeks. *dœderleini.* 8.

ee. Sides of body without stripes except anteriorly or along back.

g. Stripe on head above eye extending backward to front of soft dorsal, widening a little at the nape; a median stripe above it to the dorsal; another below, across eye and opercle....*semilineatus.* 9.

gg. Stripe on head above eye, not reaching nape; a jet black nuchal spot; a stripe from snout across eye to opercle; body unmarked save for the caudal spot.........................*notatus.* 10.

II. *Apogon.* First dorsal with 6 spines; caudal lunate.

h. Side with a broad jet black stripe from snout through eye to base of caudal; a narrower stripe above it; dorsal and anal each with a dark streak near base; body rather elongate; general color red...*kiensis.* 11.

3. APOGON NIGER Döderlein.

Apogon nigripinnis SCHLEGEL, Fauna Japonica, 1846, p. 3, Nagasaki, not of Cuvier and Valenciennes.—STEINDACHNER, Fische Japans, II, 1883, p. 1, Shikoku, as *Apogon niger* Döderlein MS.

Head 2½ in length; depth 2⅛; depth of caudal peduncle 2½ in head; eye 3½; interorbital space 3⅔; snout 3½; maxillary 2; D. VII–I, 9; A. II, 8· scales in lateral series 25; in transverse series 9.

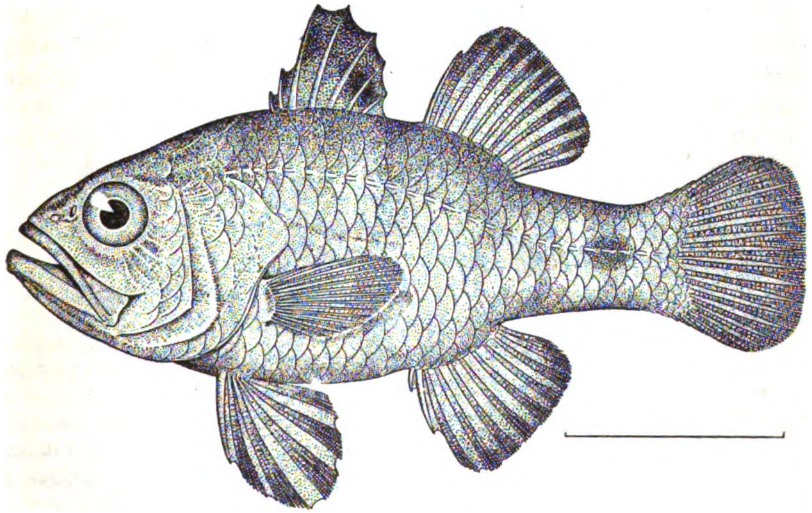


FIG. 2.—APOGON NIGER.

Body very deep; compressed; its outlines regular. Interorbital space convex; rim of orbit not projecting above contour of head; diameter of eye equal to length of snout. Mouth very oblique; maxillary extending to a vertical between pupil and posterior edge of orbit; jaws subequal, the lower slightly projecting. Edge of preopercle finely serrated. Scales comparatively firm and rough. Dorsal spines rather strong, the third longest. Soft dorsal and anal reaching equally far posteriorly when depressed, falling considerably short of base of caudal. Caudal subtruncate or slightly rounded. Ventrals reaching anal opening.

Color in life soiled brown, the sides with a greenish luster; no red anywhere. Fins dull gray, washed toward the edges with inky black; pectoral and caudal dirty yellowish; ventrals and anal most nearly black. Length about 80 or 90 millimeters.

Shores of Kiusiu and Shikoku, in southern Japan; very common in sandy bays. Known to us from about 50 specimens taken from the harbor of Nagasaki and the neighboring bay of Mogi.

The species is identified by Schlegel and by Steindachner with *Apogon nigripinnis*, Cuvier and Valenciennes, from Pondicherry, but the accounts given by Day of Cuvier's type show that this is a different fish, with dark vertical bands and a black edge to the caudal.

(*Niger*, black.)

4. APOGON MARGINATUS Döderlein.

Apogon ellioti STEINDACHNER, Fische Japans, II, 1883, p. 2, Kagoshima; Kochi in Shikoku (as *Apogon marginatus* Döderlein MS.).

Apogon sp. ISHIKAWA, Prel. Cat. 1897, p. 55, Tosa in Shikoku.

Head $2\frac{5}{6}$ in length; depth $3\frac{1}{5}$; depth of caudal peduncle $2\frac{1}{4}$ in head; eye $3\frac{3}{4}$; interorbital space $3\frac{3}{4}$; snout $4\frac{1}{4}$; maxillary 2; D. VII–I, 9; A. II, 8; scales in lateral series 25; in transverse series 7.

Body elongate, the back scarcely at all elevated; the head broad, blunt, and rounded. Interorbital space convex; upper margin of eye not projecting above dorsal contour of head; diameter of eye greater than length of snout. Mouth very oblique; maxillary extending to a vertical passing between pupil and posterior edge of orbit. Teeth on vomer, palatines and jaws villiform. Serrations of preopercle weak. Scales thin, and easily displaced. First dorsal spine very small. Anal fin, when depressed, reaching farther posteriorly than does the soft dorsal, neither reaching base of caudal. Caudal subtruncate.

Color, gray; sides silvery, doubtless flushed with red in life; very faint traces of four or five dark cross shades; no caudal spots; no distinct lines or bars; top of head closely sprinkled with black ink-like dots; lower jaw also dotted; spinous dorsal with the upper half jet black; soft dorsal with a marginal and a median black band; anal with a black median band; caudal dusky, with a median and a terminal shade made up of dark points; similar dots on pectorals and ventrals; inner margin of preopercle marked by a line of dark dots; similar dots on sides of head and on breast. Length, about 90 millimeters.

Coasts of southern Japan; said to be common in Kagoshima and Kochi, our single specimen from Wakanoura. This species is close to *Apogon ellioti* Day, from India, a species with which it is identified by Dr. Steindachner. But *A. ellioti*, in addition to the markings in *A. marginatus*, has a grayish lateral band ending in a dusky spot at base of caudal. *Apogon arafuræ* Günther, from the Arafura Sea, near Borneo, is equally closely related, but lacks the black-dotted edge of the preopercle; the soft dorsal, anal, and caudal are not colored in the same way.

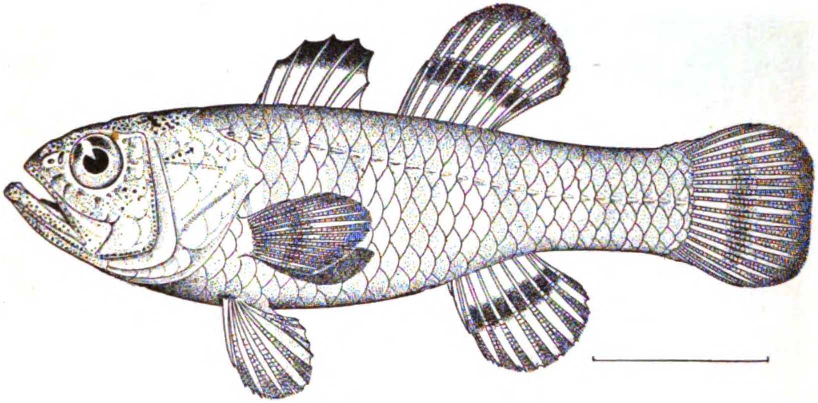


FIG. 3.—APOGON MARGINATUS.

(*Marginatus*, edged.)

5. APOGON UNICOLOR Döderlein.

(Plate XLIII.)

Apogon bifasciatus STEINDACHNER Fische Japans, II, 1883, p. 2, Shikoku, Kagoshima. (Coll. Döderlein as "*Apogon unicolor*, n. s.").

Apogon unicolor JORDAN and SNYDER, Proc. U. S. Nat. Mus., XXIII, 1901, p. 749, pl. XXXII, Yokohama.

Head 2⅔ in length; depth 2⅚; depth of caudal peduncle 6½; diameter of eye 3⅙ in head; snout 3⅔; maxillary 1⅚; D. VII–I+9; A. II+8; P. 13; scales in lateral line 25; between lateral line and insertion of spinous dorsal 2; between lateral line and anal 13.

Depth of body a little less than length of head; the caudal peduncle long and comparatively slender, narrowest near the middle. Interorbital space convex. Snout bluntly pointed.

Eye large, the diameter greater than length of snout. Mouth oblique; jaws equal; maxillary reaching almost to posterior edge of orbit; its upper edge covered for nearly the entire length by the suborbital. Teeth villiform, in bands on jaws, palatines, and vomer; the toothed area of the palatines very small. Gill-rakers on first arch

5+13; those near the center of the arch very slender; near the ends they are reduced to minute knobs.

Opercles and preopercles with large, finely ctenoid scales; other parts of head naked, the skin thin and transparent; opercle with a small sharp spine on its posterior edge. Body with large ctenoid scales; those on posterior end of caudal peduncle small, encroaching on base of caudal fin. Lateral line complete, similar in shape to contour of back.

Second spine of dorsal small; little longer than the sixth; the third strongest and highest; the others successively shorter and weaker; the fin when depressed reaching just past insertion of second dorsal. Spine of soft dorsal slender and straight; equal in height to vertical diameter of eye; the rays about 1⅔ times as long as the spine. Anal inserted below middle of second dorsal; the first spine minute; the second as long as the spine of soft dorsal; the depressed rays reaching posteriorly about as far as those of the dorsal, both falling short of the base of the caudal. The shape of the caudal can not be definitely determined. It may have been subtruncate posteriorly, at least not deeply forked. Pectorals reaching as far back as insertion of anal. Ventrals extending to a point midway between vent and insertion of anal.

Color in spirits, uniform light yellowish brown, except a subdued, dusky dash across the distal end of pectoral and an indistinct spot of same color on the opercle near the base of pectoral. Coasts of Japan, from Tokyo to Kiusiu.

Known to us from one specimen 75 millimeters long, found in the market of Yokohama by Pierre Louis Jouy. The species has been identified by Steindachner with *Apogon bifasciatus* Rüppell from the Red Sea, but it shows no trace of the dark cross-bands characteristic of that species.

(*Unicolor*, one color.)

6. APOGON LINEATUS Schlegel.

TENJIKUDAI (INDIAN PERCH).

Apogon lineatus Schlegel, Fauna Japonica, Poiss., 1846, p. 3, Nagasaki.—Bleeker, Verhand. Bat. Gen., XXV, p. 54, pl. I, fig. 1.—Günther, Cat. Fish., I, 1859, p. 239, copied.—Steindachner and Döderlein, Fische Japans, II, 1883, p. 4, Tokyo, Maizuru in Tago, Kanagawa (near Yokohama), Chefu in China.—Ishikawa, Prel. Cat., 1897, p. 55, Tokyo, Kishin.—Jordan and Snyder, Proc. U. S. Nat. Mus., 1900, p. 353, Yokohama.

Head 2⅗ to 2⅘ in length; depth 2⅗; depth of caudal peduncle 2½ in head; eye 3; interorbital space 3½; snout 5; maxillary 2; D. VII-I, 9; A. II, 8; scales in lateral series 25; in transverse series 9.

Body rather stout; anteriorly blunt; the back elevated. Eyes large, their upper edges projecting slightly above the dorsal contour of head.

Interorbital space broad, flat, with a median elevation. Snout shorter than the diameter of eye. Lower jaw projecting; maxillary extending to a point about midway between pupil and edge of orbit. Teeth villiform on jaws, vomer, and palatines; no canines. Gill-rakers 6+13; those on middle of arch very long and slender. Posterior edge of opercle with large serrations near the angle. Fins moderate; caudal subtruncate. Scales rather thin and loose.

Color grayish; sometimes slightly bluish, with pink; sides silvery; top of head and jaws dusky, with dark dots; body with 8 to 12 narrow, faint, irregular dark brownish cross-streaks; much narrower than the interspaces, and sometimes alternately narrow and broad. Spinous dorsal dark-edged; second dorsal with a dark median band and a dark edge; caudal dusky at base, with a more or less distinct dark edge; ventrals and pectorals yellowish, more or less dotted with black; anal pale yellow; no spot on caudal. Length 60 to 90 millimeters.

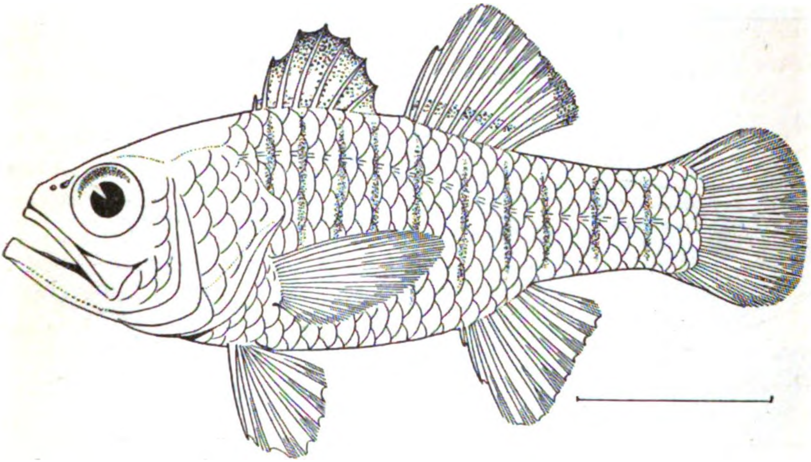


FIG. 4.—APOGON LINEATUS.

Coasts of Japan, from Tokyo southward, everywhere common in sandy bays, and becoming from its abundance a food fish of importance. It is usually known as Tenjikudai. Our specimens are from Tokyo, Yokohama, Misaki, Owari, Enoshima, Wakanoura, Kobe, Onomichi, Miyajima, Hiroshima, Tsuruga, Kawatana, Hakata, and Nagasaki.

The only variations of importance are in degree of color, some having the paired fins pale and the lateral bands faint. The length of head, size of eye, depth of body, and caudal peduncle are subject to slight variation.

(*Lineatus*, lined.)

7. APOGON SCHLEGELI Bleeker.

Apogon novemfasciatus SCHLEGEL, Fauna Japonica, Poiss., 1846, p. 2, pl. II, fig. 2, Nagasaki (not of Cuvier and Valenciennes).

Apogon schlegeli BLEEKER, Verhand. Batav. Genoots., XXVI, p. 55, after Schlegel.

Head 2⅚ in length; depth 2⅚; depth of caudal peduncle 2⅙ in head; eye 3; interorbital space 4⅔; snout 4¼; maxillary 2; D. VII–I, 9: A. II, 8; scales in lateral series 25; in transverse series 9.

Body rather elongate; the back little elevated; the head rather pointed. Eye large; the diameter much greater than length of snout; interorbital space convex; dorsal rim of orbit not projecting above contour of head. Jaws equal; maxillary extending to a vertical through posterior edge of pupil. Serrations of preopercle rather weak. Fins high; third spine of dorsal large and strong; when depressed the third, fourth, and fifth spines reach past the insertion of soft dorsal. Anal fin when depressed reaching farther posteriorly than does the soft dorsal, both falling far short of base of caudal. Caudal well forked. Ventrals reaching a little beyond anal opening. Scales large and thin.

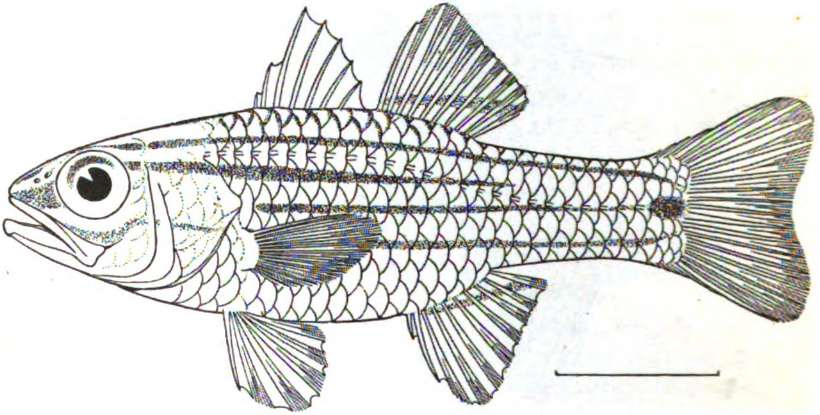


FIG. 5.—APOGON SCHLEGELI.

Color in life dirty gray, washed with pink; top of head reddish; about six longitudinal stripes, the upper olive, the lower brassy yellow; anteriorly more or less red; stripes on top of head brick red; a large black caudal spot; fins all carmine. About eight dark stripes on top of head between eyes; a distinct stripe from eye to caudal spot; another above this from snout, across upper part of eye, fading out before reaching caudal spot; another above this, just above lateral line from nape to caudal, bent downward on reaching base of caudal fin; another below the first one from anal to base of caudal, this one bent upward as the other is downward, so as to form backward converging lines above and below caudal spot; traces of another band on eye across cheek and side of belly to anal; still another more or less distinct on side of back, and often still another at base of dorsal, making seven on each side, four distinct, three faint; fins all pale, a few dark dots on caudal and dorsals; traces of a faint dusky cross-line on base of second dorsal. Length about 100 millimeters.

Coast of southern Japan, here described from four examples from Nagasaki. It is doubtless Schlegel's *Apogon novemfasciatus* (not of Cuvier and Valenciennes), based on a drawing by Bürger, though the drawing is not very correct. This is the basis of Bleeker's *Apogon schlegeli*. Later Bleeker has identified this species with his *Apogon endekataenia* from the East Indies. But *A. endekataenia* lacks the converging lines around the caudal spot; the eye is much smaller and the body more slender. We think *A. schlegeli* a valid species. It is probably not very abundant.

(Named for Prof. H. Schlegel, of Leyden, the distinguished author, jointly with Prof. C. J. Temminck, of the Fauna Japonica.)

8. APOGON DŒDERLEINI Jordan and Snyder, new species.

Head 2⅘ in length; depth 2⅗; depth of caudal peduncle 2¼ in head; eye 3; interorbital space 3; snout 4; maxillary 2; D. VII–I, 9; A. II, 8; scales in lateral series 25; in transverse series 9.

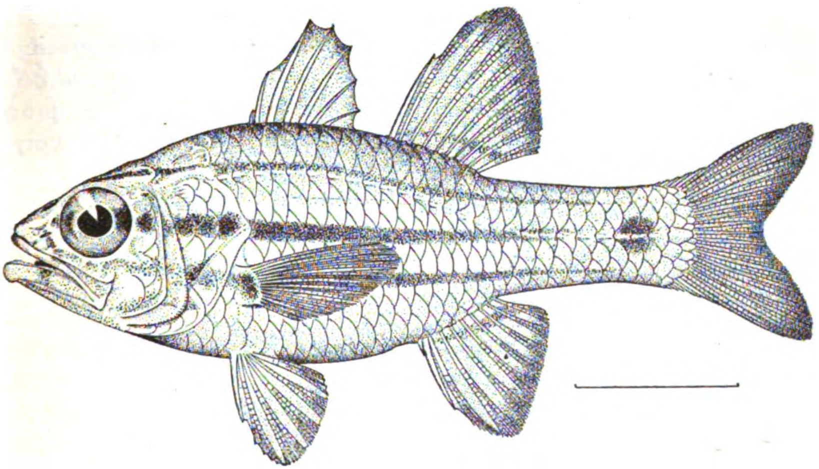


FIG. 6.—APOGON DŒDERLEINI.

Body robust; somewhat elongate; the caudal peduncle very long, slender; the back little elevated and evenly curved. Head rather pointed. Eye very large, its diameter much greater than the length of snout. Interorbital space flat, with a slight median elevation; upper rim of orbit not projecting above contour of head. Mouth large, moderately oblique; jaws equal, maxillary extending to a vertical passing a little before posterior edge of pupil. Teeth villiform on jaws, vomer, and palatines. Gill-rakers on first arch 5+13, slender, the length of the longest much less than diameter of pupil. Posterior edge of opercle finely serrated for the greater part of its length. Scales large and thin.

Fins high. First dorsal spine minute, the third high and strong; the fourth of about equal height, though more slender; when depressed just reaching insertion of soft dorsal; other spines gradually shorter. Soft dorsal and anal when depressed reaching an equal distance posteriorly, both falling far short of reaching base of caudal. Caudal deeply notched. Pectorals almost reaching a vertical through insertion of anal. Ventrals reaching anal opening.

Color in life yellowish gray, with three distinct blackish lateral stripes; a jet-black spot on caudal peduncle; top of head with two distinct stripes only; bands distinct on sides of head; a dark spot on base of pectoral. Median lateral stripe extending from snout through eye across opercle to caudal spot; an upper one running from snout above eye to tail, not extending on caudal fin and not bent downward above caudal spot; lower stripe extending from snout across suborbital, opercle, base of pectoral, to base of caudal; not bent upward on tail and not extending on caudal fin; traces of a fourth stripe along lower part of cheek and behind pectoral; these stripes made of dark dots. Fins all pale, probably red in life; the dorsals, anal, and caudal each with a faint dusky margin; no dark bar across soft dorsal.

This species is known to us from four specimens, about 100 millimeters in length, taken at Nagasaki. It is close to *Apogon schlegeli*, having the same form and general characters, but the lateral bands are fewer, more distinct, especially on the head, and they do not converge about the black caudal spot.

Type.—No. 6513, Leland Stanford Junior University Museum. (Named for Prof. L. Döderlein, of Vienna, formerly connected with the Imperial University at Tokyo, in recognition of his assiduous work on the fishes of Japan.)

Measurements of Apogon dœderleini.

Length in millimeters	91	83	67
Depth, expressed in hundredths of length	.38	.36	.35
Depth of caudal peduncle	.16	.16	.15
Length of caudal peduncle	.28	.26	.30
Length of head	.39	.41	.37
Diameter of eye	.125	.13	.13
Length of snout	.09	.09	.08
Length of maxillary	.17	.18	.18

9. APOGON SEMILINEATUS Schlegel.

NEBUTUDAI (BOTTOM TAI OR PERCH); TENGIKUJIAKO; TENSHIBUSHAKO (INDIAN LITTLE FISH).

Apogon semilineatus SCHLEGEL, Fauna Japonica, Poiss., 1846, p. 4, pl. II, fig. 3, Nagasaki.—BLEEKER, Verh. Bat. Genootsch., XXVI, p. 55, pl. I, fig. 2.—GÜNTHER, Cat. Fish., I, 1870, p. 240, copied.—STEINDACHNER and DÖDERLEIN, Fische Japans, II, 1883, p. 2, Tokyo.—NYSTROM, Handl. Svensk. Vet. Ak., 1887, p. 8, Nagasaki.—ISHIKAWA, Prel. Cat., 1897, p. 55, Enoura in Izu.

Apogon quadrifasciatus (error for *semilineatus*) JORDAN and SNYDER, Proc. U. S. Nat. Mus., XXIII, 1900, p. 353, Yokohama.

Head 2½ in length; depth 2⅚; depth of caudal peduncle 3 in head; eye 3 2/6; interorbital space 4½; snout 3 2/6; maxillary 2¼; D. VII-I, 9; A. II, 8; scales in lateral series 25; in transverse series 9.

Body rather elongate; compressed; caudal peduncle narrow; head pointed. Eye large, the diameter a little greater than length of snout; interorbital space slightly convex; upper rim of orbit not projecting above contour of head. Snout pointed; jaws subequal, the lower slightly projecting; maxillary extending to a vertical passing just posterior to pupil. Scales thin, rather roughish. Dorsal spines slender and rather weak; the first minute; placed very close to base of the second; the tip of the fourth when depressed just reaching insertion of soft dorsal. Soft dorsal and anal reaching an equal distance posteriorly when depressed, both falling far short of base of caudal. Pectorals reaching slightly beyond insertion of anal. Ventrals reaching vent. Caudal forked.

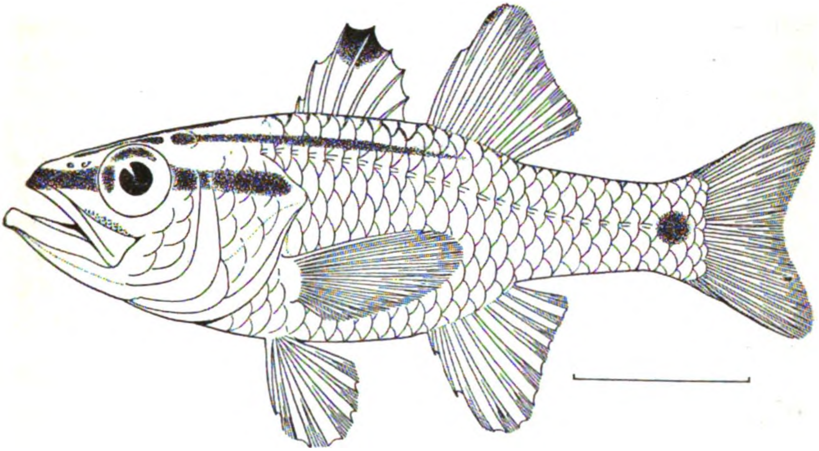


FIG. 7.—APOGON SEMILINEATUS.

Color in life light gray, flushed with bright red; sides silvery; an inky black spot as large as pupil at base of caudal; a jet-black stripe from tip of snout through eye to gill opening; another above eye from tip of snout to opposite front of soft dorsal, this usually, but not always, interrupted a little over the eye, leaving a jet-black spot on temporal region; interspaces between these lines golden yellow in life; a black median stripe from above eye to front of spinous dorsal; tip of chin black; fins all carmine; a jet-black spot at tip of spinous dorsal; a little black usually on upper edge of soft dorsal and on upper and lower margin of caudal; throat whitish. In alcoholic specimens the black markings only remain. Length about 100 millimeters.

Coasts of Japan from Tokyo southward very common. Our specimens from Tokyo, Yokohama, Yodomi, Enoshima, Misaki, and Wakanoura. It must be rare at Nagasaki, where it is mostly replaced by *Apogon notatus*.

(*Semi*, half; *lineatus*, lined.)

10. APOGON NOTATUS (Houttuyn).

Sparus notatus HOUTTUYN, Beschryving van eenige Japanse Visschen, Hollandsche, Maatschappye van Weetenschappen te Harlem, XX, 1782, pp. 311-346 (Nagasaki).

Apogon kiushiuanus Döderlein MS. STEINDACHNER, Fische Japans, II, 1883, p. 2, Kagoshima.

Head 2¾ in length; depth 2¾; depth of caudal peduncle 2¾ in head; eye 3; interorbital space 3½; snout 3⅙; maxillary 2¼; D. VII-I, 9.

Body rather elongate; the dorsal and ventral contours evenly rounded; caudal peduncle much narrower at base of caudal fin than anteriorly. Head pointed; snout sharp; lower jaw projecting considerably. Eye large, its diameter greater than length of snout; interorbital space somewhat convex; upper edge of orbit not projecting above contour of head. Maxillary extending to a vertical passing through posterior edge of orbit. Edge of preopercle rather strongly serrated throughout the entire length (this character varying consid-

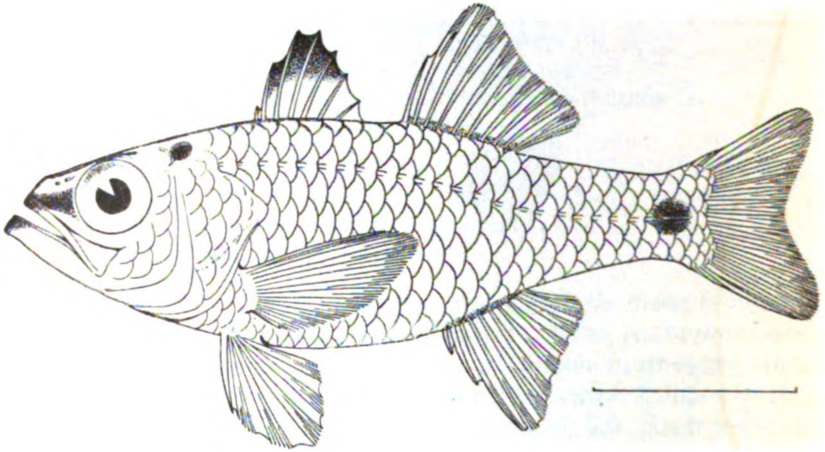


FIG. 8.—APOGON NOTATUS.

erably). Fins low. Dorsal spines weak and slender; the first minute; the third strongest, but not so high as the fourth; the fifth, when depressed, just reaching insertion of soft dorsal. Anal reaching slightly farther posteriorly than does the dorsal, both failing to reach base of caudal by a considerable distance. Caudal notched. Ventrals reaching vent.

Color in life, grayish, flushed with red, and much dotted; a round jet-black spot at base of caudal; a very black band across chin, and snout to eye, where it fades, though traces of it are seen behind eye; a jet-black stripe on top of head on each side from snout, ceasing above pupil; a median stripe from top of head to first dorsal; snout otherwise mostly golden yellow; a round jet-black spot on each side of nape; fins carmine; first dorsal with a broad black edge; other fins pale or slightly dotted; a golden streak across lower half of eye. In spirits the black coloring only is retained. Length about 100 millimeters.

This species is very close to *Apogon semilineatus*, with which all observers save Dr. Döderlein have confounded it. It is deeper in body, and with blunter snout. The most obvious difference lies in the fact that the uppermost of the paired black stripes does not reach the black nuchal spot and is not continued behind it. The range of *A. notatus* is more southern.

Our numerous specimens are from Nagasaki; a single one from Wakanoura.

(*Notatus*, spotted.)

11. APOGON KIENSIS Jordan and Snyder, new species.

Head 2⅜ in length; depth 3⅙; depth of caudal peduncle 3 in head; eye 3; interobital space 4½; snout 4⅔; maxillary 2; D. VI–I, 9; A. II, 8; scales in lateral series 25; in transverse series 8.

Body rather elongate; compressed; dorsal contour somewhat arched; caudal peduncle slender. Head large; snout pointed; lower jaw projecting. Interorbital space flat or slightly convex; a low median ridge present; eye large; its diameter considerably greater than length of snout. Maxillary passing through a point midway between pupil and posterior border of eye. Teeth villiform; on jaws, vomer, and palatines. Gill-rakers on first arch 5+14; long and very slender. Serrations of opercle rather coarse. Scales thin; easily detached.

Fins of moderate height and length. The small first dorsal spine, present in other Japanese species of the genus, is absent in this form. Second spine of fin highest and strongest; the spines when depressed not touching insertion of soft dorsal. Anal when depressed reaching a little farther posteriorly than does the soft dorsal, both falling far short of base of caudal. Ventral fins reaching anal opening. Pectorals extending a little farther posteriorly. Caudal notched.

Color grayish, probably red in life; a jet-black stripe from tip of snout across eye and sides of body to tip of caudal; this stripe widened and most distinct on the opercle; no distinct caudal spot, the stripe unbroken; this stripe half width of eye and bordered above and below by a pale streak; a second dark stripe above it, barely a fourth as wide from snout above eye to opposite middle of soft dorsal; no spots or streaks below the broad stripe; sides of head silvery; fins pale, except for a black cross stripe on soft dorsal and anal near the base, and the black lateral stripe continued on the caudal. The relative width of the two black stripes and the distinctness of the opercular spot is subject to some variation. The extension of the lateral band to the tip of the caudal will serve to distinguish the species from any other in Japan.

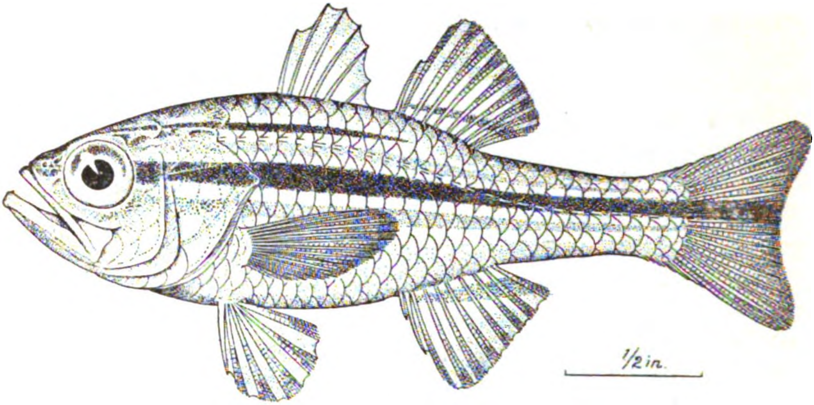


FIG. 9.—APOGON KIENSIS.

Type.—No. 6514, Leland Stanford Junior University Museum.

Smallest of the Japanese Apogonidæ, not exceeding 650 millimeters in length. We have 38 specimens taken at Wakanoura, in the province of Kii, one of the richest collecting grounds for fishes yet known in any part of the world.

Measurements of Apogon kiensis.

Length in millimeters	59	57	56	56	58	57	55
Depth, expressed in hundredths of length	.32	.30	.33	.34	.335	.32	.32
Depth of caudal peduncle	.12	.125	.14	.14	.125	.125	.125
Length of caudal peduncle	.28	.27	.28	.27	.28	.28	.30
Length of head	.37	.35	.40	.39	.36	.35	.39
Diameter of eye	.12	.12	.12	.12	.12	.12	.125
Length of snout	.8	.75	.8	.85	.9	.8	.8
Length of maxillary	.18	.18	.19	.18	.18	.19	.18

3. ARCHAMIA Gill.

Archamia GILL, Proc. Ac. Nat. Sci. Phila., 1863, p. 81 (*macropterus*).

This genus is distinguished from *Apogon* by the long anal, its rays being II, 13 to 17. Dorsal spines, 6. East Indies.

(αρχός, anus; *Amia*, an old name of *Apogon*.)

12. ARCHAMIA KAGOSHIMANA Döderlein.

Apogon (*Archamia*) *macroptera* STEINDACHNER, Fische Japans, II, 1883, p. 3, Kagoshima (not of Bleeker).

Apogon kagoshimanus DÖDERLEIN MS. in Steindachner, Fische Japans, II, 1883, p. 3.

Head 2½; depth a little greater; D. VI–I, 9; A. II, 16; scales 26. Eye 3 in head.

Preopercle very finely serrate; maxillary to posterior part of eye. Dorsal spines very slender, the second not quite half head. Pectoral as long as caudal, reaching sixth soft ray of anal; ventral reaching front of anal.

Body reddish, strewn with violet points. No spot at base of caudal nor on scapula; fins pale. (Steindachner.)

Kagoshima, island of Kiusiu, a single specimen, sent to Dr. Steindachner by Dr. Döderlein, not seen by us. Notwithstanding its lack of the conspicuous caudal spot characteristic of *Archamia macroptera* (Bleeker), of the East Indies, Dr. Steindachner does not feel warranted in separating it as a distinct species. In view of the permanence of this mark, and of the essential difference of the Japanese shore fauna, from that of the East Indies, we adopt the name suggested by Dr. Döderlein. (Name from *Kagoshima*, "basket island.")

4. PARAMIA Bleeker.

Cheilodipterus LACÉPÈDE, Hist. Nat. Poiss., III, 1802, p. 539 (*saltatrix*, *macrodon*, etc., restricted by Cuvier and Valenciennes, in 1828, to *macrodon;* but the first species mentioned (*saltatrix*), more properly the type, is a species of another group.)

Paramia BLEEKER, Revision Apogonini, 1874, p. 74 (*macrodon*), the name *Cheilodipterus* being transferred to *Pomatomus saltatrix*.)

Body oblong, covered with rather large, deciduous scales; teeth on jaws, vomer, and palatines, some of them in both jaws strong, canine-like; operculum without spine; preopercle with a double margin, the posterior edge serrated; eye large. Dorsal fins separated, the rays VI-I, 10. Anal II, 9; caudal forked. Tropical seas. Small fishes differing from *Apogon* chiefly in the presence of canines in the jaws.

(*παρά*, near; *Amia*, a nonbinomial name applied by Gronow to *Apogon*.)

13. PARAMIA QUINQUELINEATA (Cuvier and Valenciennes).

Cheilodipterus quinquelineatus CUVIER and VALENCIENNES, Hist. Nat. Poiss, II, 1828, p. 167, Society Islands.—? RÜPPELL, Neue Wirbelthiere, Fische, p. 89, Red Sea.—LESSON, Zool. Voy. Duperr., II, p. 237.—BLEEKER, Amboyna and Ceram, p. 252, Amboyna.—GÜNTHER, Cat. Fish., I, 1859, p. 248, Amboyna; Fishes of Zanzibar, p. 22.—DAY, Fishes of India, p. 66.—STEINDACHNER, Fische Japans, II, 1883, p. 4, Kagoshima.

Paramia quinquelineata BLEEKER, Atlas, Percoid., I, 1876, p. 105, pl. XLVIII, fig. 2, Sumatra, Nias, Batu, Singapore, Bangka, Cocos, Java, Celebes, Sangir, Solor, Halmahera, Ternata, Batjan, Amboyna, Goram.

? *Apogon novemstriatus* Rüppell, Neue Wirbelthiere, p. 85, pl. XXII, fig. 1, Red Sea.

? *Sparus meaco* Lacépède, Hist. Nat. Poiss, IV, 1803, pp. 54, 160, Japan, on a manuscript of Thunberg.—Cuvier and Valenciennes, Hist. Nat. Poiss, II, 1828, p. 161. "Brown, with 6 white bands and a brown spot on the tail; scales large; jaws each with two canines; caudal rounded. D. IX–10. A. III, 8." The canine teeth seem to locate this very doubtful description near *Paramia quinquelineata* rather than with *Apogon schlegeli.*

Head $2\frac{3}{5}$; depth $3\frac{3}{5}$; D. VI–I, 9; A. II, 9. Scales 25. Eye 3 in head. Maxillary reaching to beyond middle of eye. Body with five longitudinal stripes of violet along the sides, the third one forming a spot at base of caudal; an unpaired sixth stripe along the belly from throat to vent; caudal with numerous diffuse cross-bands (Steindachner). Bleeker describes the black spot on the tail as ocellated with yellow, its center brown.

East Indies, a single specimen 130 millimeters long taken at Kagoshima by Dr. Döderlein and referred by Steindachner to this species; not seen by us. The identification is perhaps doubtful.

(*Quinque*, five; *lineata*, lined.)

8. MELANOSTOMA Döderlein.

Melanostoma Döderlein, Beitrage zur Kentniss Fische Japans, II, 1883, p. 5 (*japonicum*).

Body rather elongate, covered with rather large, cycloid, deciduous scales, about 35 in lateral line; scales of head covered with very small scales; eyes large; jaws with a band of villiform teeth and with strong canines in front; small or villiform teeth on vomer and palatines; preopercle with its angle produced and with soft serrations; dorsal rays IX–I, 10; anal II, 7. Vent normal. Coloration black. Deep waters of Japan, distinguished from *Paramia* chiefly by the increased number of dorsal spines.

(*μέλας*, black; *στόμα*, mouth.)

14. MELANOSTOMA JAPONICUM Döderlein.

Melanostoma japonicum Steindacher and Döderlein, Fische Japans, II, 1883, p. 6, off Tokyo.

Head 3; depth 4; D. IX–I, 10; A. II, 8; scales 36; eye $3\frac{2}{5}$ in head; snout $4\frac{2}{5}$. Body oblong, the back not much elevated; small scales on head covering the larger ones; base of soft fins more or less scaly; jaws equal; maxillary extending a little beyond middle of eye; supplemental maxillary evident; both jaws with a narrow band of villiform teeth, broader above; upper jaw with a strong canine in front on each side; lower jaw with about 5 canines; the fourth longest; fourth dorsal spine about half head; soft dorsal and anal concave on the margin; caudal forked; anal spines short, the second half eye; pectoral as long as head, without snout; swim bladder present; pyloric cœca 6 or 7.

Color everywhere black, including the mouth cavity. (Steindachner and Döderlein.)

Deep water outside of Tokyo Bay (near Misaki); one specimen 22 mm. long in the museum of Vienna; not seen by us.

6. TELESCOPIAS Jordan and Snyder, new genus.

Telescopias JORDAN and SNYDER, new genus (*gilberti*).

Body oblong, covered with small, thin, cycloid scales; jaws with small scales; soft fins mostly covered with small scales; eyes very large; mouth very large, with strong teeth; teeth in jaws principally in one series, canine-like, those in front of upper jaw and in sides of lower jaw largest; vomerine teeth villiform; palatine teeth small canines; preopercle with a produced membranous angle; first dorsal with eight spines; soft dorsal and anal long; concave on the margin; caudal lunate. Japan, in the Black Stream or Kuro Shiwo.

Size larger than in other genera of *Apogonidæ*. It differs from *Melanostoma* mainly in the stronger dentition, the uniserial teeth of the jaws, and in the smaller scales.

(τελεσκόπος, far-seeing, from the large eyes.)

15. TELESCOPIAS GILBERTI Jordan and Snyder, new species.

KUROMUTSU: BLACK SCOMBROPS.

(Plate XLIV.)

Head 3⅙ in length; depth 4⅓; depth of caudal peduncle 3½ in head; eye 3½; interorbital space 5¼; snout 3½; maxillary 2¼; D. VIII–I, 13; A. II, 13. Scales in lateral series about 63; in transverse series 21.

Body elongate, the back not elevated; caudal peduncle somewhat cylindrical at its narrowest part. Head almost as deep as body. Interorbital space flat; its width about equal to three-quarters of the diameter of eye. Eye large; its diameter equal to length of snout; preorbital very narrow. Snout pointed. Lower jaw projecting; maxillary extending to a perpendicular, passing a little behind center of pupil; its posterior edge rounded. Upper jaw with an outer row of sharp canines; widely spaced; larger and stronger at anterior end of jaw, where there is a group of several on each side; posterior part of jaw with an inner, short row of minute teeth; lower jaw with a single row of sharp teeth similar to those above; largest on sides of jaw; vomer with a small patch of villiform teeth; palatines with a series of small, sharp teeth. Tongue notched anteriorly; with small patches of blunt teeth. First gill-arch with 10 long, slender gill-rakers, 1 on the upper part, 9 on the lower. Pseudobranchiæ large. A shallow pocket or fold between the preopercle and suspensorium of jaw opening into gill-chamber. Edge of preopercle without serrations; a large striated flap at its angle. Branchiostegals 7.

Head, except lips and branchiostegal region, covered with smooth, thin scales, these overlaid with smaller ones; those on upper part of head, on snout, and lower jaw small and minute. Body with large, smooth, thin scales. Fins all completely covered with small scales.

First dorsal spine somewhat more than half as long as the second; inserted close to it; third spine longest; fin when depressed fitting into a narrow groove; the tips of the spines not reaching insertion of soft dorsal. Spine of soft dorsal closely adnate to the first ray; membrane of fin thick and fleshy. Anal inserted below the middle of soft dorsal; the first spine very short; both spines closely adnate to the first ray; edges of both dorsal and anal fins concave. Caudal deeply notched. Pectorals pointed, about 1⅔ in head. Ventrals short, about 2⅙ in head.

Color everywhere blackish gray; lining of mouth and gill chambers bluish black.

Length about 500 millimeters.

Type.—No. 12657, Leland Stanford Junior University Museum. The type and a similar specimen were taken on long hand lines (dabonawa) by Kumakichi Aoki in the deep water between Misaki and the island of Oshima.

(Named for Professor Charles Henry Gilbert.)

7. SCOMBROPS Schlegel.

Scombrops TEMMINCK and SCHLEGEL, Fauna Japonica, 1846, p. 118 (*cheilodipteroides* = *boops*).

Latebrus POEY, Memorias, II, 1860, p. 168 (*oculatus*).

Body elongate, covered with small, thin, smooth scales; mouth very large; lower jaw longest; 2 to 4 long canines in upper jaw, besides strong lateral teeth; a series of canines in lower; teeth in bands on vomer and on palatines; preopercle not serrated; its angle produced; opercle with 2 feeble points; tongue notched; eye large. Branchiostegals 7. Dorsals separated, the first of 8 very feeble spines; anal spines 3; soft dorsal and anal rather long, of 12 to 14 rays, the membranes scaly. Pyloric cœca 6 to 15. Gill-rakers long. Soft-bodied fishes, living in rather deep water.

(*Scomber*, mackerel; ὤψ, appearance.)

16. SCOMBROPS BOOPS (Houttuyn).

MUTSU; OKIMUTSU (OFF SHORE MUTSU).

Sparus boops HOUTTUYN, Beschryving Jap. Visschen, 1782, pp. 311–346, Nagasaki.

Scombrops boops JORDAN and SNYDER, Proc. U. S. Nat. Mus., XXIII, 1901, p. 750.

Scombrops SCHLEGEL, Fauna Japonica, Poiss. 1847, p. 118, pl. LXII, fig. 2, Nagasaki.

Scombrops cheilodipteroides BLEEKER, Verhand. Bat. Gen. XXV, Japan, p. 9; XXVI, Japan, p. 58, Nagasaki.—GÜNTHER, Cat. Fish., I, 1859, p. 249, Japan.—STEINDACHNER and DÖDERLEIN, Fische Japans, II, 1883, p. 5, "in ganz Japan."—NYSTROM, Handl. Svensk. Vet. Ak., 1887, p. 9, Nagasaki.—JORDAN and SNYDER, Proc. U. S. Nat. Mus., XXIII, 1900, p. 353, Tokyo.

Head 3⅙ in length; depth 3⅔; depth of caudal peduncle 3¼ in head; eye 3⅕; interorbital space 4⅖; snout 3¼; maxillary 2; D. VIII–I, 13; A. III, 13; scales in lateral series 53; in transverse series 17.

Body rather elongate, the dorsal and ventral contours evenly rounded. Head elongate, pointed. Eye large, the margin not projecting above dorsal contour of head; interorbital space flat or slightly convex. Snout sharp, its length about equal to diameter of eye. Mouth not very oblique; lower jaw slightly projecting; maxillary extending to a point about midway between pupil and posterior edge of orbit; its posterior edge rounded. Teeth in single rows on jaws, canine-like, very sharp; those of lower jaw largest on the sides; the corresponding ones of the upper jaw much smaller; a group of 3 or 4 large teeth on anterior part of upper jaw; very small, sharp teeth on vomer and palatines. Tongue notched. Gill-rakers on first arch 6+15, long and slender, those farthest from angle of arch very small. Pseudobranchiæ large. A shallow pocket or fold between suspensorium of lower jaw and preopercle, opening into the branchial cavity. Edge of preopercle entire; its lower part with a large flap. Branchiostegals 7.

Head completely scaled except on lips and branchiostegal region; scales of interorbital area, snout, maxillary, and lower jaw minute. Body with rather small, smooth scales, which are easily displaced. Soft dorsal, anal, and basal parts of pectorals, ventrals, and caudal with minute scales.

Spinous dorsal rather low; the fin when depressed not nearly reaching insertion of soft dorsal. Second dorsal and anal with thick, fleshy membranes; posterior edges of fins concave; first spine of anal very small. Caudal deeply notched. Pectorals pointed; their length about 1⅞ in head. Ventrals 2 in head.

Color steel blue or grayish; belly more or less yellowish; a faint dusky spot on upper part of opercle; inside of mouth pale.

Coast of Japan, generally common, in water of considerable depth, 20 to 400 fathoms. It is an excellent food-fish of soft flesh and is common in the markets as *Mutsu*. Our many specimens are from Same, Minato, Matsushima, Awa, Tokyo, Misaki, Enoshima, Tateyama, Wakanoura, Kobe, and Nagasaki.

(*βοῦς*, bull; *ὤψ* eye; from the large eye.)

8. ACROPOMA Schlegel.

Acropoma SCHLEGEL, Fauna Japonica, Poiss., 1846, p. 31 (*japonicum*).

Body oblong, covered with moderate-sized deciduous, ciliated scales. Mouth large, the lower jaw longest; villiform teeth in both jaws and on the vomer and palatines, besides very small teeth in each jaw; preopercle entire; opercle produced in a very long thin membraneous flap, with a denticulate edge. Vent inserted far forward, nearer the base of the ventrals than the anal. Dorsal rays VII–I, 10; anal III, 7. Caudal forked.

The single species resembling *Apogon*, but with the vent very differently placed. It is arranged, perhaps justly, in a separate family by Dr. Theodore Gill.

(ἄκρος, sharp; πῶμα, opercle.)

17. ACROPOMA JAPONICUM Günther.

Acropoma SCHLEGEL, Fauna Japonica, Poiss., 1847, p. 31, pl. XII, figs. 2, 3, Nagasaki.

Acropoma japonicum GÜNTHER, Cat. Fish., I, 1859, p. 250, after Bleeker.

Head 2⅔ in length; depth 3⅔; depth of caudal peduncle 3⅓ in head; eye 3¼; interorbital space 4½; snout 3½; maxillary 2⅔; D. VII–I, 10; A. III, 7; scales in lateral series about 49; in transverse series 10 or 11.

Body rather elongate; the back a little elevated. Margin of eye not projecting above dorsal outline of head. Interorbital space somewhat convex; a low ridge in the middle. Snout shorter than diameter of eye; pointed. Lower jaw projecting beyond the upper; maxillary reaching a perpendicular through center of pupil; its posterior edge concave. Teeth in bands on jaws, vomer, and palatines; some of those in front of upper jaw and on tip and sides of lower jaw enlarged in slender canines; tip of lower jaw elevated; the canines on the raised part. Gill-rakers on first arch 5+14; long and slender. Pseudobranchiæ large. Tongue pointed. Preopercle with a double edge, entire; the posterior part very thin. Opercular flap long; with 2 or 3 small denticulations posteriorly.

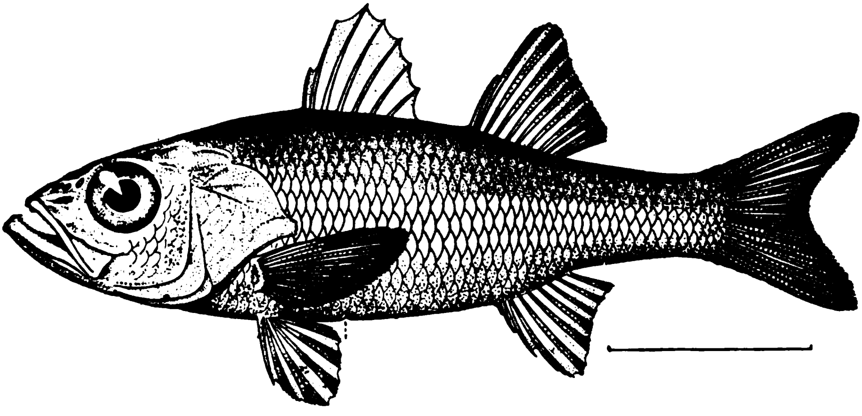


FIG. 10.—ACROPOMA JAPONICUM.

Scales thin, weakly ctenoid, easily displaced.

Dorsal spines slender, not reaching insertion of soft dorsal when depressed. Membranes of soft dorsal and anal fins very thin, not fleshy; anal inserted below a point a little posterior to middle of dorsal;

edges of both fins concave. Caudal deeply forked. Pectorals pointed, contained about 1½ in head. Ventrals about 2 in head; extending beyond anal opening, which is located far forward.

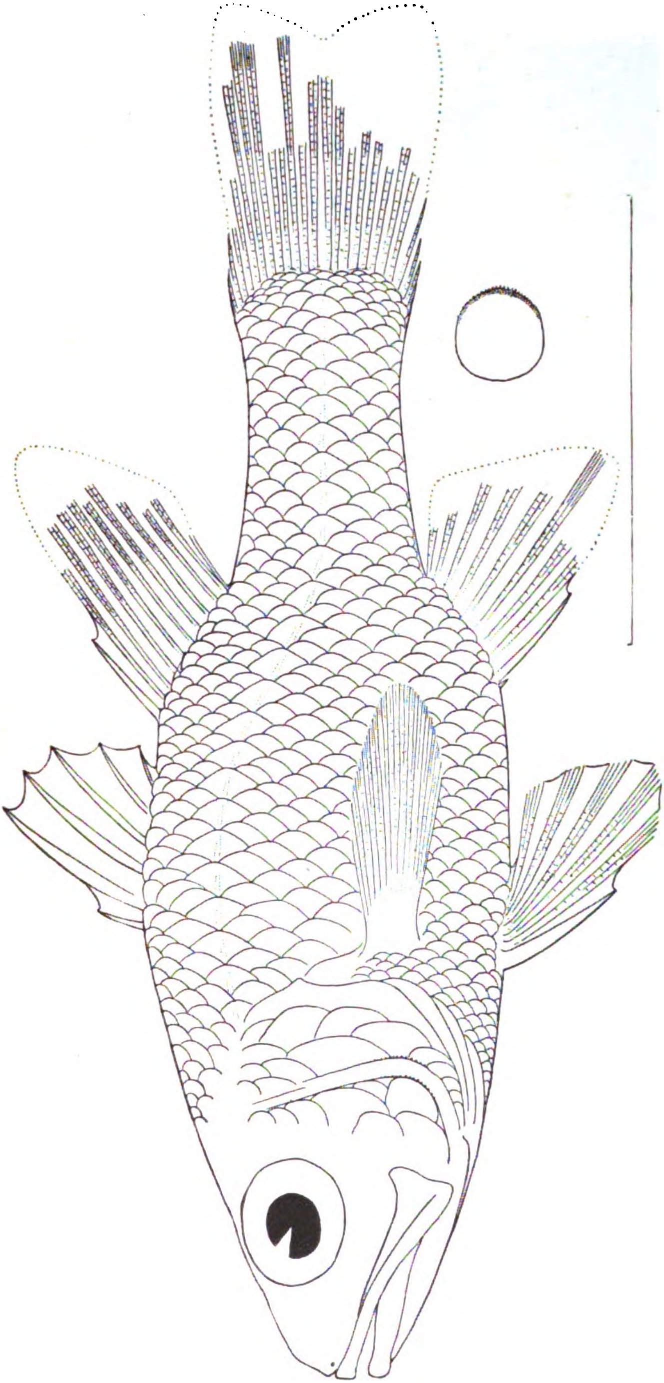
Color in life, light red; lower half abruptly silvery; fins all light reddish; inside of gill chamber blackish. Alcoholic specimens retain much of the silver on the lower parts, have the upper edge of the orbit dusky, and have a somewhat indefinite dusky longitudinal band on lower half of body.

Length 80 to 125 millimeters. An interesting species allied to *Scombrops* and *Apogon*, but with the vent advanced forward. Southern Japan; rather rare. Our specimens are from Wakanoura and Misaki.

RECAPITULATION, WITH LOCALITIES.

Family APOGONIDÆ.

1. *Apogonichthys* Bleeker.
    1. *carinatus* (Cuvier and Valenciennes); Misaki, Wakanoura, Nagasaki.
    2. *glaga* (Bleeker; not seen).
2. *Apogon* Lacépède.
    § *Ostorhinchus* Lacépède.
    3. *niger* Döderlein; Nagasaki, Mogi.
    4. *marginatus* Döderlein; Wakanoura.
    5. *unicolor* Döderlein; near Yokohama.
    6. *lineatus* Schlegel; Tokyo, Yokohama, Owari, Enoshima, Wakanoura, Kobe, Onomichi, Miyajima, Hiroshima, Tsuruga, Kawatana, Hakata, and Nagasaki.
    7. *schlegeli* Bleeker; Nagasaki.
    8. *dœderleini* Jordan and Snyder; Nagasaki.
    9. *semilineatus* Schlegel; Tokyo, Yokohama, Yodomi, Enoshima, Misaki, Wakanoura.
    10. *notatus* (Houttuyn); Wakanoura, Nagasaki.
    § *Apogon*.
    11. *kiensis* Jordan and Snyder; Wakanoura.
3. *Archamia* Gill.
    12. *kagoshimana* Döderlein; not seen.
4. *Paramia* Bleeker.
    13. *quinquelineata* (Cuvier and Valenciennes); not seen.
5. *Melanostoma* Döderlein.
    14. *japonicum* Döderlein; not seen.
6. *Telescopias* Jordan and Snyder.
    15. *gilberti* Jordan and Snyder; Misaki.
7. *Scombrops* Schlegel.
    16. *boops* (Houttuyn); Same, Minato, Tateyama, Matsushima, Awa, Misaki, Enoshima, Wakanoura, Kobe, Nagasaki.
8. *Acropoma* Schlegel.
    17. *japonicum* Günther; Wakanoura, Misaki.



APOGON UNICOLOR.

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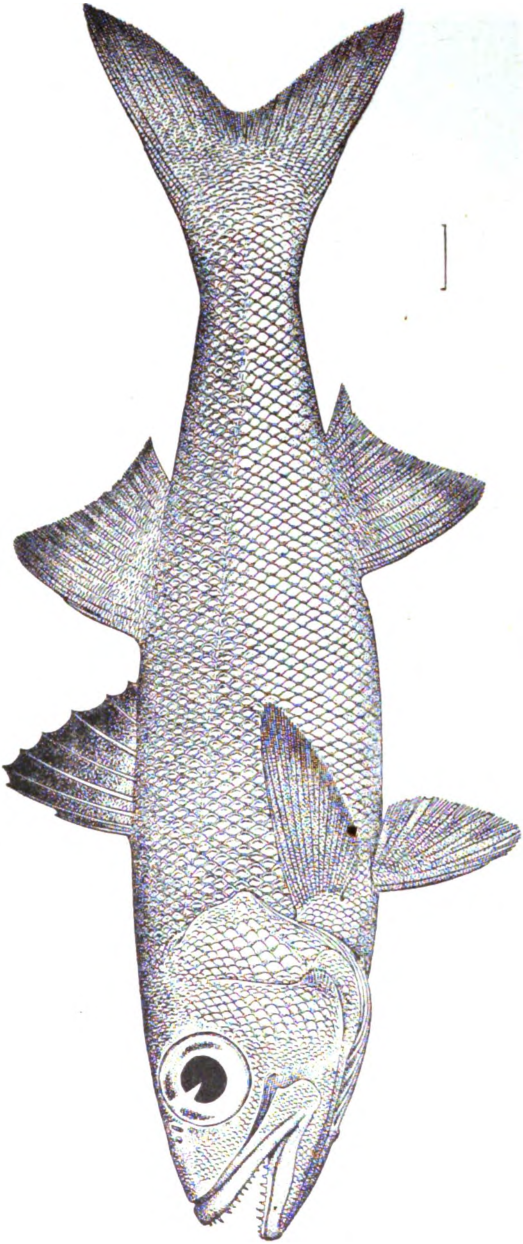

TELESCOPIAS GILBERTI.

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[1] As an index to Mr. William H. Ashmead's paper, Classification of the Ichneumon Flies, or the Superfamily Ichneumonoidea (this volume, pp. 1–220), was specially prepared by its author, the titles in that paper are omitted in this index.

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